THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The important new development in the market is the beginning of inquiry from leading railroads for rails for next year. It was not until September of last year that large rail contracts were placed for 1902. More accurate data on crop conditions than will be available for two or three months may be awaited by some lines before contracting for next year, but there is evidence that others have plans already made for track extensions that will bring them into the market in the near future to make sure of deliveries when needed. Coming after the heavy 12-months' contracts for bars made by agricultural works and car shops last month, rail inquiry this early is another index of the prolongation into 1903 of strong conditions in the iron trade. As yet no action on rail prices for next year has been taken by the manufacturers. Continued activity in relaying rails and their sale at the contract price of new rails for 1902 indicates how inadequate is the present rail mill capacity to the situation. Labor conditions have possibilities of trouble in some directions, but the bar, sheet and tin plate mills are guaranteed uninterrupted operation for 14 months by the decision of the Amalgamated Association convention at Wheeling to ratify the scales made by its executive committee some weeks ago. Structural workers in the Central West may cause an interruption of work for a time, a strike being promised for May 1. The union blast furnace workers in the Mahoning and Shenango Valleys have postponed their strike for an 8-hour day from May 1 to June 1, ostensibly to give time to serve formal notice on the furnace managers, but it is evident that much remains to be done in organizing the men. In the foundry trade there are a number of local wage troubles, but no serious disturbance. New erection within the iron industry and related lines is still one of the main stays of prosperity in iron and steel. As a single example, the Westinghouse interests have let contracts that will require 17,000 tons of structural steel in the Pittsburg district. As part of the program of the United States Steel Corporation the erection of mammoth bridge works in the Pittsburg and Chicago districts is announced. For new buying of pig iron, steel and finished material the past week has not been conspicuous. Quieter conditions are to be expected after the heavy buying of early months. The payment of premiums for early-delivery pig iron is still a feature. The $20 level for Bessemer and foundry iron has been reached, and in the case of the latter passed. Basic and gray forge are scarce and at high-level prices. Virginia gray forge has been quoted at $20 delivered in the Mahoning Valley, but no sales are reported. For No. 2 foundry, delivery in the last quarter, $20, Chicago, is now the basis, with higher prices paid for quick delivery. The steel shortage bids fair to be a continuing factor to the end of the year. Large steel companies are picking up every ton of Bessemer iron offered for this year's delivery, and are straining every nerve to get the full efficiency of their converting capacity. Pig iron and steel imports are limited by higher prices abroad, but sheet manufacturers will import sheet bars for the second half if they can be bought below 1 cent a pound at foreign mill. Above this price the duty becomes $2.24 a ton more. The British iron market is stronger. Middlesbrough pig iron has advanced 50 cents a ton in April, or $1.25 above the low point for the year.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, April 30.

The scarcity of Bessemer iron grows more pronounced daily, despite the increased output of the Valley furnaces during the past month and that of the big steel producers. Outside of carload lots, no iron is to be had for delivery before July 1, and furnacemen and brokers having iron for delivery after that period are holding out for still higher prices. It is conservatively estimated that the steel plants of the United States Steel Corporation are short fully 75,000 tons of Bessemer iron for delivery the remainder of the year and the country is being scoured to secure iron to make up this shortage at reasonable prices. Other large steel producers, including the Cambria Steel Co. and Jones & Laughlins, Ltd., are also short of iron for delivery the remainder of the year and where it is to come from is now the perplexing problem. For delivery the second half of the year the Cambria Steel Co. purchased 10,000 tons of Bessemer at $19.50 at the furnace, which at present is the ruling quotation for this delivery. Foundry and forge irons also continue high, but are practically stationary, owing to the limited buying in both.

Naturally the scarcity of Bessemer makes the steel situation the more perplexing and billets for delivery through the second half of the year are quoted at $32 to $33 per ton, Pittsburg, and only small lots are going at these prices. Owing to the inability of the steel producers to take orders for large tonnages of both sheet bars and billets, the independent sheet and tin plate mills are commencing to make inquiry for foreign steel for delivery the last half of the year. Inquiries are in the market for no less than 10,000 tons of sheet bars and steel billets and a large portion of this tonnage will be contracted for within the next few days. The German steel market continues to stiffen owing to the demand from this side and the indications are that foreign prices will further advance, and hence an increased duty of $2.24 per ton will have to be paid. Nearly all the contracts for foreign material closed up to date have been taken at the consumer's risk, and should the steel market advance in Germany to $22.40 or higher, Antwerp, additional duty of 1-10 cent per pound will have to be paid under the sliding tariff on raw steel. Sheet bars are now quoted $21.25, Antwerp, and billets and slabs about 50 cents a ton less. An advance of a little more than a dollar a ton on sheet bars would result in making the Pittsburg delivery price $36.50 per ton, which would make further importation impossible owing to the present prices of the finished sheets. We note the purchase of 2,000 tons of German billets for shipment west of Pittsburg on a basis of $32.50, Pittsburg.

The steel rail market continues to attract considerable attention inasmuch as many of the smaller roads in the South, not being able to secure early shipments of rails from the large producers are buying relaying rails. The railroads, on the other hand, especially those in the North, with large accumulations of relayers are offering them on the market. The Erie Railroad last week disposed of 10,200 tons of relayers, ranging in weight from 60 to 75 pounds, at $27.50, which is an enormous price, considering the basis on which standard sections were sold for this year, and the heavy percentage of wasters in

all lots of relaying rails. Other roads are also offering relayers to the dealers, and upwards of 14,000 tons are scheduled for sale in the month of May. With such a large tonnage on the market it would seem that the present high prices must decline. There is very little activity in the scrap market generally owing to the high prices ruling and heavy consumers are holding off.

There is little to fear from labor difficulties in the iron and steel trade this year. The Amalgamated Association in convention at Wheeling, W. Va., ratified the action of its executive officials in signing scales for the year ending June 30, 1903, and outside of changing a few footnotes, the scales remain the same as at present. The blast furnace workers have also decided to give the furnace operators until June 1 to consider their demand for an 8-hour day. The structural workers within a radius of 100 miles of Pittsburg and throughout the State of Ohio will no doubt strike on Thursday. They are demanding an 8-hour day and 50 cents an hour. The American Bridge Co. offered to compromise at 47½ cents an hour, but the men refused to accept. Tonight a meeting is to be held in Cleveland by the structural workers to act upon the offer of the American Bridge Co. for an advance to 47½ cents an hour, and there is some possibility that the compromise will be accepted. If it is the structural workers in this district alone will walk out.

PIG IRON.—Nearly all the steel companies are short of Bessemer iron for the year and the country is being scoured to secure all the available iron at fair prices. The Cambria Steel Co. placed an order for 10,000 tons for delivery the last half of the year at $19.50 at the furnace, while the United States Steel Corporation would no doubt purchase Bessemer at about this price if any were available. For carload lots delivery to July 1, furnacemen are securing $20 and $20.25 at the furnace, while brokers with odd lots of iron are holding off for still higher prices. There is little buying of foundry iron, but the market continues strong nevertheless. We note the sale of a very soft No. 2 iron, 900 tons for delivery the second half of the year, at $21.50, Pittsburg. Strong No. 2 foundry is quoted at $20.50 to $21, Pittsburg. There is little forge moving, although furnaces are holding their iron at $19.25 to $19.50, Pittsburg. Basic iron in small lots has advanced to $19.75, Pittsburg. We revise quotations as follows:

Bessemer, Valley	$19 50 to 20 25
Bessemer, Pittsburg	20 25 to 21 00
No. 1 Foundry	21 00 to 22 00
No. 2 Foundry	20 75 to 21 50
No. 3 Foundry	19 50 to 20 00
Gray Forge, Pittsburg	19 50 to 20 00
Chilled Basic, Valley	18 75 to 19 00
Chilled Basic, Pittsburg	19 50 to 19 75

STEEL.—We note the sale of several small lots of Bessemer billets for prompt shipment at $32.50. There is considerable inquiry for foreign steel for delivery the second half of the year, and unless the foreign market advances there will be considerable buying within the next few days. German billets can be laid down in Pittsburg at $32.50 and sheet bars at $33. The rod market is very firm and as high as $38 has been paid for Bessemer rods for prompt shipment. For future delivery they are quoted at $36.50 to $37.

SPELTER.—The spelter market continues fairly firm, with somewhat better prices ruling. Prime Western grades are quoted 4.27½c to 4.30c, Pittsburg.

FERRO-MANGANESE.—Domestic 80 per cent continues to be held at $52.50 per ton, delivered at buyer's mill. Foreign manganese is held at $50 per ton.

MUCK BAR.—Muck iron for prompt delivery continues scarce and we note the sale of a 100-ton lot at $35. For future delivery $33.50 is asked.

SKELP.—Steel skelp is practically out of the market. Iron skelp has advanced considerably and for prompt shipment sheared skelp is held at 2.25c, and grooved at 2.10c. For future deliveries these quotations could be shaded about .05c.

RAILS AND TRACK MATERIAL.—The demand for small lots of rails from the small roads in the South is very large. Relaying rails are in demand, inasmuch as desirable deliveries on new rails cannot be secured. We note the sale of 10,200 tons of relaying rails by the Erie Railroad at $27.50. These were purchased by a dealer and will not be sold in small lots below $29. Light rails for prompt delivery continue in heavy demand and high prices are paid. We make the following quotations: standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $45; 12 pounds, $42; 16 pounds, $39; 25 to 40 pounds, $37; 20 to 40 pounds, $33. Track material: Spikes, 2c to 2.05c; track bolts, square heads, 2.50c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—The plate manufacturers report the volume of new business as being very good and the market is strong. Prices remain unchanged as follows: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c, and it ranges in price to 3c. Plates more than 100 inches wide, 5c extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—Steel bars for prompt shipment still command premiums of about $2 per ton and considerable business is being done on this basis. The mills are making much better deliveries on bars than for some time, the railroads having moved nearly all accumulated stocks. We make the following quotations: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under three inches, 1.70c; over three inches, 1.80c; bar iron, 1.70c to 1.80c, Pittsburg, with full freight added to point of delivery. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots; refined iron bars, 2c and upwards.

PIPES AND TUBES.—The pipe market continues in good condition and both the independent companies and the National Tube Co. are securing all the business they can take care of. We quote:

MERCHANT PIPE.

	Black. Per cent.	Galv. Per cent
⅛ to ⅜ and 11 to 12 inches	60	48
¼ to 12 inches	67	55

Discounts below are to consumers, carload lots, Pittsburg:

BOILER TUBES.

Steel.

	Per cent.
1 to 1½ inches	45
2¼ to 5 inches	63½
1¾ to 2¼ and 6 to 13 inches	58

Iron.

	Per cent.
1 to 1½ and 2½ inches	39
1¾ to 2¼ inches	38
2¾ to 13 inches	48

CASING.

	S. and S. Per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12½ inches	65

SHEETS.—The demand for the heavier gauges of sheets is heavy and the mills are securing small premiums for prompt deliveries. Our quotations are as follows: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets, in carload lots to consumers, are quoted at 3.05c for Nos. 10 and 11, 3.45c for Nos. 18 to 21; 4.20c for No. 27, and 4.50c for No. 28. Galvanized sheets, mill shipments in carload lots, are as follows: No. 14, 3.06c; No. 16, 3.18c; No. 20, 3.38c; Nos. 22 and 24, 3.69c; No. 26, 3.95c; No. 27, 4.20c; No. 28, 4.47c. Quotations on mill shipments in less than carloadload lots are as follows: No. 14, 3.25c; No. 16, 3.35c; No. 20, 3.56c; Nos. 22 and 24, 3.88c; No. 26, 4.15c; No. 27, 4.40c; No. 28, 4.67c. For shipment from warehouse jobbers ask 5 cents per hundred above the latter quotations which may be considered the quotoations to the average consumer.

STRUCTURAL STEEL.—The Westinghouse Electric & Mfg. Co. has awarded a contract to the American Bridge Co. for the erection of an immense addition to its plant, requiring fully 9,000 tons of material. About a month ago a contract was awarded the American Bridge Co. by the Westinghouse Machine Co. for the erection of an immense foundry at Trafford Park, requiring about 8,000 tons of steel. Quotations remain unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—At a meeting of the wire and wire nail manufacturers held last week it was decided to let present

quotations stand. A meeting of the cut nail manufacturers will be held this week, but no change in prices is anticipated. We make the following quotations: Wire nails in carload lots, $2.05 per keg; smaller lots, $2.10 and $2.15; plain wire, $2 in carload lots and $2.10 in less than carload lots to retailers; galvanized wire, $2.40 in carload lots; polished staples, $2.20, and galvanized staples, $2.60; painted barb wire, $2.60, and galvanized, $2.90. These prices are quoted on a Pittsburg base, plus the actual freight to destination. Cut nails are held at $2.05 in carload lots and $2.10 in less than carload lots, Pittsburg, plus freight to destination.

MERCHANT STEEL.—Demand for crucible steel is reported very heavy and all the crucible steel manufacturers are receiving heavy orders daily. We revise quotations as follows: Turned, cold rolled and ground shafting in carload lots is quoted 50 off, and in less than carload lots, 45 off; tire steel, 1.80c in carload lots and 2c less than carload lots; toe calk, 2.10c to 2.25c; sleigh shoe, 2.10c to 2.25c; machinery steel, 1.70c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—The large consumers of scrap are not buying at present high prices and as a result the price of heavy melting stock has declined. Rails for relaying purposes are held at $28 to $29 a ton and for rerolling at $24 to $24.50 a ton. Small lots of low phosphorus melting stock have been sold at $24, gross ton. We revise quotations as follows: Heavy wrought scrap, $19.25 to $19.50; cast scrap, $17.50 to $17.75; iron rails, $24 to $25; car wheels, $19; cast borings, $11.50 to $12, wrought turnings, $13.50 to $14; steel rails, short lengths, $18 to $19; steel rails for rerolling purposes, $24 to $24.50.

COKE.—The Connellsville *Courier* says that the estimated production of coke in the Connellsville region for the week ending Saturday, April 19, amounted to 222,284 tons, an increase of nearly 2,000 tons over the production of the previous week. The *Courier* states that there is a weekly demand for 275,000 tons and that the region could produce that amount if the railroads had the facilities for making shipments. Connellsville furnace coke is held at $2.50 per ton and foundry at $3. Outside cokes are quoted about 25 cents less.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
934 MONADNOCK BLOCK, April 29.

Briefly summed up, this market continues to be monotonously good. Most all the mills are sold up on their respective products for periods varying from four to eight months. All the furnaces until within the last week have been out of the market, and all the large buyers have covered for their wants, immediate and prospective. There is plenty of inquiry, however, but new business is generally limited to transactions in small lots. Consumers with large orders to place, for whatever kind of material, find much difficulty in getting mills to accept the same, unless it is for shipment several months hence. The most noteworthy feature of the trade in this city is the phenomenal activity of jobbers. These practically control the local situation, and consumers in urgent need of finished iron and steel are compelled to buy from the jobbing trade and pay fancy prices for their stocks.

PIG IRON.—A local producer is now offering iron for sale for deliveries in the last quarter and extending into next year, and has advanced its prices for these shipments to the basis of $20 a ton for No. 2 foundry. This is the only company selling iron in this market at the present time, all the others having withdrawn several weeks ago. There is no cessation in the volume of inquiries, but as the majority of them want the iron immediately, sales rarely follow. Spot iron is very scarce, and some sellers are buying iron back from their customers and selling it to others who need it badly. We quote as follows:

Lake Sup. Charcoal	$22 50 to $23 00	Southern Coke No. 4	$17 15 to $18 15
Local Coke Fdy. No. 1	21 00 to 21 50	Southern No. 1 Soft	18 65 to 19 65
Local Coke Fdy. No 2	20 00 to 23 50	Southern No. 2 Soft	18 15 to 19 15
Local Coke Fdy. No. 3	19 50 to 20 00	Southern Gray Forge	16 90 to 17 90
Local Scotch Fdy. No. 1	21 00 to 21 50	Southern Silveries	18 25 to 19 65
Local Scotch Fdy. No. 2	20 50 to 21 00	Jackson Co. Silveries	23 10 to 23 60
Southern Coke No. 1	18 65 to 19 65	Ohio Strong Softeners	23 10 to 23 60
Southern Coke No. 2	18 15 to 19 15	Alabama Car Wheel	23 65 to 24 15
Southern Coke No. 3	17 65 to 18 65	Malleable Bessemer	20 30 to 20 50

BARS.—The aggregate tonnage of new business closed each week is large, though individual orders rarely exceed 500 tons, and range from this amount down to carload lots. Jobbers are profiting handsomely by the condition of mills. They are doing a large business, being able to furnish both iron and steel promptly, and where immediate shipment is needed, premiums are asked and cheerfully paid. Owing to the wide difference in the price of the two materials there is a much greater demand for steel, but as the mills are sold on this material several months ahead, buyers are compelled to substitute iron and pay the present market price. Quotations are held firmly at 1.75c to 1.85c for steel, Chicago; 1.95c for iron, Chicago; 2.15c for hoops, Chicago. Prices out of store, steel, 2c to 2.10c; iron, 2.10c to 2.25c; hoops, 2.30c to 2.40c.

SHEETS.—There is a good steady demand for all sizes of sheets, both black and galvanized. Mills still remain considerably behind in deliveries. We quote No. 27 black, mill shipments, Chicago delivery, 3.15c to 3.25c; galvanized, 4.40c to 4.50c; out of store, No. 27 black, 3.45c to 3.55c; galvanized 4.70c to 4.80c.

STRUCTURAL STEEL.—Jobbers in this city report they are receiving orders for material from all over the country, and that their stocks are depleted almost as fast as they are received from the mill. It is difficult to place a market price on the different shapes and sizes, as they differ in the various yards according to the stock on hand. Local offices of Eastern mills that have stocks in their warehouses report they are still selling on the basis of 2.50c. No change has been made in mill prices, which are as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; structural angles, 3x3 to 6x6, 1.75c; over 6x6, 1.85c; angles, channels and tees, smaller than 3 inches, 1.85c base; plates, 1.85c; lots from store, tees, 3c minimum; beams and channels, 3c minimum with cartage charges.

RAILS AND TRACK SUPPLIES.—Several inquiries have been received in the past week for standard sections, and as buyers now appear willing to accept such deliveries as mills can make, some business is expected to develop. There is a good demand for light rails and track supplies, though mills are sold up for several months on both these lines. We quote standard sections, $28; light rails, 45 pounds, $33; 12 pounds $40, with regular differentials for intermediate sizes; out of store, $45 to $50; splice bars, 2c; spikes, carload lots, 2.35c; track bolts and hexagon nuts, 3.10c to 3.25c; out of store, 3.50c; square nuts, base, 2.95c; out of store, 3.10c.

BILLETS.—There have been a few small sales in the past week, though it is extremely difficult to purchase either Bessemer or open-hearth billets in this market. We quote Bessemer billets, $38; open-hearth, $40.

MERCHANT STEEL.—Local sellers report that new business continues to be of fair proportions. Nearly all the large buyers have covered for their wants, and current orders are for small lots. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.95c to 2c; open-hearth spring steel, 2.45c to 2.60c; sleigh shoe, 1.75c to 1.80c; flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15c to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk 2.25c to 2.35c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 per cent to 10 per cent higher; cold rolled shafting, carload lots, 50 per cent off, Chicago; less than carload lots, 45 per cent off, Chicago.

MERCHANT PIPE.—There is a good demand for merchant pipe, though there is not the heavy buying of this material that is the case in other lines. We call attention to the changes in the grouping and prices of boiler tubes. One week ago mills made a general advance to jobbers in both iron and steel tubes, of approximately 5 per cent. In some sizes it was more, in others less. Jobbers have advanced the price of iron tubes, as given below, but have made no change in the quotations on steel. We quote as follows:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ in.	56½	44½
½ to 12 in.	63½	51½

BOILER TUBES.

	Steel Per cent.	Iron Per cent.
1 to 1¾ in.	35	35
1¾ to 2½ in.	50	32½
2¾ to 5 in.	57½	35
6 in. and larger	52½	42½

CAST IRON PIPE.—There is a good demand coming from all parts of the country, particularly for the smaller sizes of pipe, and manufacturers report they are sold up for about two months on 4-inch, 6-inch and 8-inch pipe. The local concern reports having received orders for 4,000 tons of pipe from the city of Chicago, 1,800 tons from Milwaukee, and 12,000 tons from St. Louis. We quote as follows: 4-inch water pipe, $31, carload lots, f. o. b. Chicago; 6-inch water pipe and larger sizes, $29 to $30; gas pipe, $1 a ton higher than these prices.

PLATES.—There is a good demand for plates, the bulk of which goes to jobbers. The local mill is sold up till July and has announced that it will accept no new business for delivery after this date, until the amount of the prospective advance has been determined upon. We quote as follows, Chicago delivery. Tank steel, base, ¼-inch, 1.85c to 1.95c; flange steel, 1.95c to 2.05c; marine steel, 2.05c to 2.15c; fire box steel ordinary, 2c to 2.10c; special, 2.25c and upward.

WIRE AND WIRE NAILS.—There is an active demand for all kinds of wire products, and the local interest is working its mills to their full capacity in the effort to keep up with its orders. We quote as follows: Smooth wire, carload lots, $2.15; painted barb wire, $2.75; galvanized barb wire, in carload lots, $3.05; wire nails, carload lots, $2.20; staples, carload lots $2.30; jobbers' prices to retailers, 10 cents higher than above for carload lots, and 20 cents for less than carloads.

COKE.—A full supply of coke, both from Pennsylvania and West Virginia fields is now being received in this market, and consumers can get very promptly all the tonnage they need. We quote $5.50 for Connellsville, and $5 to $5.25 for West Virginia coke.

OLD MATERIAL.—The scrap iron market still holds its own and no changes are announced in quotations. There is a good demand for all kinds of material and sellers find no difficulty in disposing of their stocks. We quote gross tons, a follows:

Old iron rails	$24 00 to $25 00	Old steel rails, mixed	$16 50 to $17 00
Old steel rails, 5 ft. and up	23 00 to 24 00	Relaying rails	27 00 to 28 00
Old steel rails, 3 ft. and under	18 00 to 18 50	Old wheels	19 50 to 20 00
		Heavy melting steel	16 00 to 17 00
		Mixed country steel	13 50 to 14 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to $20 00	Steel axles	$19 00 to $19 50
No. 2 R. R. wrought	18 00 to 18 50	Cast borings	8 50 to 9 00
Dealers' forge	15 50 to 16 00	Wrought turnings	12 50 to 13 00
No. 1 busheling	13 50 to 14 00	Iron axle turnings	14 00 to 14 50
No 1 R.R. & mch.cast	13 50 to 14 00	Steel axle turnings	13 00 to 13 50
Railway Malleable	15 00 to 15 50	Stove plates	10 50 to 11 00
Country malleable	13 00 to 14 00	Old iron splice bars	21 00 to 21 50
Iron axles	24 50 to 25 00		

The interests of the firm of Gardner & Robinson, Monadnock Block, Chicago, iron and steel selling agents, have been consolidated with those of A. M. Crane & Co., Inc., The Rookery, Chicago, and the two firms will be conducted in the future under the name of A. M. Crane & Co., Inc. The officers will be as follows: A. M. Crane, president; C. R. Robinson, vice president; W. A. Green, treasurer, and B. M. Gardner, secretary and assistant treasurer. Both A. M. Crane & Co. and Gardner & Robinson have been doing a large business in iron and steel products, and have been operating along very much the same lines. It is expected that the consolidation will put them in position to extend their operations greatly, and to engage in larger transactions than either firm has handled heretofore. Their business will be conducted as iron and steel merchants, and they will sell all lines of iron and steel products, raw and finished material. All the agencies which have been heretofore held by the individual firms will be conducted by the consolidated company. Foreign connections have been established, with facilities for importing steel billets, structural shapes, rails and other material. A feature of the business will be conversion arrangements between manufacturers.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1084 ROSE BUILDING, April 30.

Additional ore sales are made almost daily, chiefly in lots running from 5,000 to 20,000 tons; yet there are furnace companies who have not yet bought sufficient ore to cover pig iron actually sold. There is no evidence in the current buying that furnaces are planning to shift from Bessemer to foundry iron or vice versa, and for some time the relation between the various lines of output promises to be maintained substantially as it is. No change in ore prices has come since the opening sales. A considerable tonnage of ore is yet to be sold, but each week is adding a good aggregate to the sales books of local firms. Some of the early estimates of production on the Mesabi Range were in excess of what now promises to come to market. There is no doubt of the ability of the mines to produce the tonnages talked of, but the machinery of transportation, except with a material improvement over conditions as they existed last season, would not be adequate to landing such a tonnage in furnace yards in a single season. Lower lake dock companies are not in as good shape for the opening of the season as they could wish, though the movement of ore to furnaces has been fairly good in the past two weeks.

PIG IRON.—No great amount of business is being done, because furnace companies haven't the iron to ship as wanted. The short supply of iron for the second quarter of the year is evidenced almost daily. Foundries are doing an increasing amount of work and therefore the pressure upon furnaces for deliveries is greater rather than less. Most of the Valley furnaces producing foundry iron are sold up for the year and there is no indication that other furnaces heretofore on Bessemer are going on to foundry. Gray forge is being sought in outside furnace districts, but the South has little to offer. Virginia furnaces have quoted $20 on forge iron delivered to Valley mill, but this is regarded as prohibitive. For foundry iron premiums are paid for delivery before July 1, and prices for the second half are also getting on a premium basis. Charcoal iron is sold up for the year, apart from such odd lots as may be made beyond estimated production. We quote at $22, Lake Erie port. Valley furnacemen have another month to consider the 8-hour day demand and some effort will no doubt be made this month to arrange the matter so as to avoid a strike. Not all the furnaces are organized as yet. Bessemer and basic irons have sold only in small lots in the past week. The former is quoted $19.50 at Valley furnace and the latter $19. We quote the Cleveland market as follows:

Bessemer	$19 75 to $20 75	Scotch No. 1	$20 25 to $21 25
No. 1 Strong F'dry	20 25 to 21 25	Scotch No. 2	19 25 to 20 25
No. 2 Strong F'dry	19 25 to 20 25	Gray forge, Valley	18 50 to 18 75
No. 3 Foundry	18 25 to 19 25	LakeSuperior charc'l	22 00 to 23 00

FINISHED MATERIAL.—Though the mills can make no further deliveries this year, some transactions in structural steel are reported, the buyers covering business they had taken for erection, deliveries to be made when the mills can turn out the material. We note local sales of 2,500 tons. Plate mills are quite well sold and are no longer seeking business. On the 1.60c basis, Pittsburg, for tank, which is the price of steel bars, plates are not an attractive proposition for the mills, the waste making the cost about a tenth more than that of bars. The possibility of an advance in plates is being considered and opinions of producers differ. Some mills are restricting sales on the present basis to delivery before July 1. The merchant pipe trade through jobbers is rather quiet, but the mills are exceedingly busy on pipe line and other large business. The bar trade shows a steady run of orders from smaller buyers. In bar iron prices are firmly held on a basis of 1.80c Pittsburg and 1.88½c Cleveland. The price of scrap has advanced to a point at which the mills find but narrow profit in the prices quoted earlier in the year. Jobbers are not a unit in advancing the store price on bar iron, and 1.90c and 2c Cleveland are both quoted. Steel bars are still 1.68½c Cleveland on carload shipments and 1.90c out of store. Activity in sheets is only moderate. Prices are well held on black sheets, but competition between independent mills and the consolidation is more noticeable in galvanized, as it has been for some months. We quote the following prices on mill sales: No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3.10c; No. 18, 3c to 3.15c; No. 20, 3.05c to 320c; Nos. 22-24, 3.15c to 3.30c; Nos. 22-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c, for one pass cold rolled. For full cold rolled .10c extra is charged. On galvanized sheets Cleveland prices to consumers are as follows for carload lots: Nos. 10 and 11, 3.15c; Nos. 12 to 14, 3.25c; Nos. 18 to 21, 3.55c; Nos. 22 to 24, 3.85c; No. 27, 4.35c; No. 28, 4.60c.

OLD MATERIAL.—On some materials prices have recently been pushed up rapidly resulting in considerable offerings, with in some cases a slight reaction from the highest prices. Sellers are firm in their views, but buyers are not disposed to make large purchases on the present basis, believing the top has been reached and that any changes will be in their favor. Ouotations for Cleveland delivery, all in gross tons, are as follows:

Old iron rails	$ 24 00 to 26 00
Old steel rails (6 ft. and over)	21 00 to 23 00
Old steel rails (6 ft. and under)	17 00 to 19 00
Old car wheels	18 00 to 19 00
No. 1 R. R. wrought scrap	21 00 to 22 00
Mill scrap	17 00 to 18 50
No. 1 machine cast scrap	15 00 to 16 00
Iron axles	26 00 to 28 00
Axle turnings	16 00 to 17 00
Wrought turnings (free from cast)	13 50 to 14 00
Cast borings	9 00 to 10 00
Uncut wrought iron boilers	11 00 to 12 00
Steel boiler plates	16 00 to 17 00
Grate bars	11 00 to 12 00
Pipes and flues (clean)	17 00 to 18 00
Tank iron	17 00 to 18 00
Hoop and band iron	13 00 to 14 00
Sheet iron	11 00 to 12 00
Wrought drillings	13 00 to 13 50
Malleable iron	17 00 to 18 00
Stove plate	12 50 to 13 50
Heavy steel	17 00 to 18 00

CINCINNATI.

April 30.

There has been an air of expectancy about the iron trade for the week. In the first place it has been anticipated by some at least that a change would come in the pig iron market by May 1 and that the large Southern producers might again offer iron. In the second place it has been hoped by consumers that the market for finished material might ease up some and that they might secure better deliveries on orders than they have been accustomed to up to this time.

Every branch of trade that has anything to do with the iron market has been in excellent shape. Several large machine tool concerns and manufacturers of special machinery and special products out of iron have begun additions and extensions or have secured new sites upon which to build entirely new plants. Municipal corporations, public lighting and water companies and the like have been buyers of iron pipe in good amounts and continue to come into the market in spite of high prices. Building operations in and about Cincinnati are going to be larger than they have been in years, and the demand for structural iron and steel is unusually heavy. Machinery is being shipped to all points for new enterprises and improvements in old ones. Manufacturers of vehicles, implements and the like are expecting a continuation of present good demands.

PIG IRON.—The market for pig iron has been quiet. Buying has been confined to small lots for delivery during the last half of the year and prices have been for the most part on the basis of $15 for No. 2 foundry at Birmingham. Southern foundry grades have been selling more than others and buyers appear to have covered pretty completely for the year. There is some expectation that at least one of the large Southern producers will on May 1 resume selling iron. It has been reported that it was the intention of the Tennessee Coal, Iron & Railroad Co. when it should sell iron again to sell at $12, but the statement was made last week that this was not likely, and it is now understood that if the Sloss company should enter the market again it would not be at this low figure.

It is to be remembered that while there is not much iron to sell for the remainder of the year it is also true that there is not the demand for it that there was some months ago, as the consumers have largely covered. There is a prospect of some increase in the producing capacity in the South. One additional furnace has been blown in by the Sloss-Sheffield Co. at Sheffield, with a capacity of 250 tons. About the middle of May another will be blown in at Birmingham with a capacity of 250 tons. This will give the company seven furnaces in blast in that district, there being now in blast three at Birmingham, one at Florence and two at Sheffield. There is no change in prices at which pig iron may be quoted at Cincinnati. The following are given as prices at which iron can be had:

Southern Fdy. No. 1			$17 75 to 18 50
"	"	2	17 25 to 18 00
"	"	3	16 75 to 17 50
"	"	4	16 25 to 17 00
So. Fdy. No. 1 soft			18 25 to 19 00
So. Fdy. No. 2 soft			17 25 to 18 00
Gray Forge			$16 25 to 16 75
Northern Fdy. No. 1			21 00 to 21 25
"	"	2	20 50 to 20 75
Southern C. W. Iron			21 75 to 22 75
Malleable coke iron			20 60 to 21 10

FINISHED MATERIAL.—The first advance in the price of sheets put into effect in a long time has had no appreciable effect on the demand. The market for this material and for all forms of finished material has been good and there has been absorbed all the material that can be promised for delivery inside of any reasonable time. Bars are firm and the movement is considered good. Manufacturers are in the market for material of all kinds and it is expected that the vehicle manufacturers will be good customers now that they are in good running shape after the long drawn out strike that shut some of them up for quite a while. Iron bars remain at 1.92c and steel at 1.72c. Angles are 2.20c; plates, 1.85c; sheets, No. 28, 3.35 to 3.40c; No. 12 blue annealed, 2.50c.

OLD MATERIAL.—The scarcity of pig iron has made the demand for scrap better than it would otherwise have been, though not sufficient to advance the price materially, Scrap is scarce and it would appear that there is little railroad scrap coming out, this being explained, however, by the inability of the railroads to take care of such business as scrap. The following prices are for the various descriptions at Cincinnati:

Old No 1. Wrought Railroad, net tons	$ 19 00 to 19 25
Cast Machine and Foundry, net tons	13 75 to 14 00
Old Iron Rails, gross tons	24 00 to 24 25
Old Steel Rails, gross tons	24 00 to 24 25
Old Short Lengths, gross tons	17 00 to 17 25
Old Iron Axles, gross tons	23 75 to 24 00
Old Iron Car Wheels, gross tons	18 50 to 19 50
Stove Plates, gross tons	10 50 to 10 75
Wrought Turnings, net tons	13 00 to 14 00
Cast Borings, net tons	7 50 to 8 50

PHILADELPHIA.

April 29.

The scarcity of iron to meet demands during May and June continues to trouble sellers as well as purchasers, and special efforts are being made to relieve the latter if they are old customers. Several cargoes of pig iron and steel have arrived from Nova Scotia and Continental ports but the volume of material offered has had but little influence on the general market. Buyers are beginning to realize that they have but little to gain by forcing their orders on unwilling sellers. Demand continues to exceed all expectations and the prospect of obtaining supplies in greater volume does not appear very favorable. The scarcity of material is not confined to any certain department but extends from the mine to the smallest consumer.

PIG IRON.—Operations are being retarded at several points owing to the universal scarcity of iron, and the cost of production is materially increased at many works who can not keep their plants agoing to their full capacity. The midsummer months, during which consumption is generally curtailed, are now depended upon to bring the two ends of the market closer together. There are no material changes to record during the week, the range of values for Philadelphia and nearby points covering deliveries during the last half of the year being about as follows: No. 1 X foundry, $19.50 to $20.50; No. 2 X foundry, $19 to $19.50; No. 2 plain, $18.75 to $19.25; standard gray forge, $17.75 to $18.25; ordinary gray forge, $16.75 to $17.50; Basic (chilled), $18 to $18.50. Iron on which delivery can be guaranteed at an earlier date commands a premium of from 50c to $1 above these figures.

FINISHED MATERIAL.—In some departments orders are more numerous than the mills can take care of, notably in plates and sheets, in which it is difficult to contract for prompt shipments unless premiums are paid. The situation in structural material is somewhat relieved by importations and in many cases orders are being filled from store at less than the figures quoted by mills. The bar manufacturers claim that they will be compelled to make a further advance if a higher wage rate has to be paid and the cost of material keeps at prevailing figures. Official quotations continue as follows: Plates, ¼-inch and thicker, 1.95c to 2c; bars, steel, 1.80c to 1.85c; iron, 1.95c; angles, 1.75c to 1.85c; beams and channels, 1.75c to 1.85c.

OLD MATERIAL.—The market is irregular, with every indication that the high mark has been reached. Consumers in general predict that easier prices are at hand. Bids and offers are about as follows for deliveries buyers' yards: Choice railroad scrap, $25.50 to $26; ordinary light scrap, $16 to $17; machinery cast, $18.25 to $18.75; heavy steel scrap, $21 to $22; old iron rails, $25 to $26; wrought turnings, $16.75 to $17.50; cast borings, $10 to $10.50; old iron axles, $26.50 to $28; old steel axles, $24 to $25; old car wheels, $18 to $19.

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A FURTHER WORD ON "SHOP BETTERMENT."

The writer of the article elsewhere in this issue dealing with the National Cash Register Co. and its methods, has confined himself to the mechanical details of the elaborate system of organization and management found at that establishment. He has said little or nothing of the labor difficulties of the firm or the shop betterment features that have made this plant in a sense a spectacular enterprise. Yet these are worthy of some mention at this time, particularly in view of the events and the discussions of the past year.

The head of the company has sought by precept and example to create a system that would break down the sense of caste and the feeling of opposition between the employer and the employed. He has not only made the grounds of the plant examples of artistic arrangement, but by means of flowers, pictures, and abundance of light and pure air, good food and cleanly surroundings inside the shops he has given a comfortable environment to the employed. Throughout the development of this enterprise he has disclaimed the credit of charity or the giving of alms and has asserted the paying character of his efforts for social and factory betterment as being aimed at the development of a skilled and interested force of employes.

The labor troubles at Dayton last year, the discharge of certain workmen and the demand from the union for their reinstatement, were followed by a lockout of the entire force. The reopening of the plant, the boycotting of the product, and the more recent adjustment of the trouble between the company and the unions with the co-operation of the Natonal Civic Federation, are fresh in the public mind. It is very evident in spite of the years of apparently ideal relations at the Dayton plant that the adoption of these advanced methods does not avoid the possibility of a strike or a lockout, and the trouble of last year brought out a good many pessimistic utterances concerning attempts at shop betterment.

In passing and as a matter of record we note a recent statement by the National Cash Register Co. that some changes in the "unusual factory features" described in the company's literature were made as a result of the labor troubles. All the features discontinued at the time of the strike were restored except the N. C. R. house—in part, the deaconess, prize excursions, boys' brigade, progress club, Sunday school, and library on wheels. The public schools having taken up the kindergarten and penny savings bank, the maintenance of these institutions by the company was not considered longer necessary.

The company has always given a cordial reception to the various labor organizations, has had and has now to all intents and purposes a union shop. The general shop policy in manufacturing is based upon the establishment of piecework conditions. The two things may be compatible to some degree but such a basis does not make any assurance for future harmony. Piecework conditions are inferior to the premium plan in this very particular and the periodic adjustments of the piecework rates will not do other than engender discord. Then the situation is resolved into the old trouble. Shall the employer preserve his independence and make his own terms with his workmen, or shall he relinquish the management to the popular demand for arbitration? Only to a very limited extent can ths latter be done, as no board of arbitration can at short notice understand the details of his position, particularly the intricacies of piecework adjustments, and the arrangement is more likely at best to have a sentimental rather than a practical outcome.

The recognition of the union is in itself fraught with grave dangers. Permission to organize is a club whereby the other workmen can be forced into a union or "take the consequences." Recognition of the union, as technically understood, places the company upon a status of conference with labor leaders and delegates in regard to shop conditions and hampers the personal intercourse of the individual workmen and the employer.

There are benefits to be derived from organization, either of employers or employed, and it is conceivable that the strike or the lockout may be the only weapon to attack an obnoxious situation; but it is a two-edged sword, and if the organizations could by some educational influence be brought into more cordial appreciation of each other's difficulties so barbarous a remedy would be but very rarely required.

The educational efforts in betterment lines at Dayton did not avoid a serious disagreement, but the trouble seems to have been due to the efforts of a limited number of employes. There will always be the few who regard the efforts of others with a jealous eye, even if the work is designed for their benefit. The generous appreciation is lacking and the money spent freely on artistic and comfortable surroundings is to them but so much filched from wages. As a matter of fact it is wages in the sense that it is an improvement in which they share as freely as though they had paid the bill. So long as the average wage is as good as that to be had elsewhere—or as good as the best, as at Dayton—there can be no reason to criticize the company for spending money on the plant or its surroundings.

The present condition at Dayton may be but a truce, with smoldering fires ready to blaze out with full fury

when least expected. The antipathy of the union to the frequent readjustment of piecework rates and the probable effort by the union to limit production in behalf of those who will not or cannot achieve a higher productive efficiency may again precipitate a crisis. Those who have followed the enterprise through the few but pregnant years of its existence, with appreciative interest in the admirable spirit and purpose of the organization, will wish for it a future free from strife, and for success in the effort for better working conditions there and elsewhere. Not every manufacturer can have the exclusive right to the production of a popular machine. But the influence of environment upon the individual is so generally conceded in respect to industrial operations that every endeavor to better working conditions is as natural as to improve equipment. If it be said that a strike may occur even under a "betterment" regime, that is no more an argument against betterment methods than is the possibility of a strike in the best equipped plant in the country an argument against machinery of the most approved type. How far this may be developed to the advantage of the product and without seriously crippling financial resources is a question for each employer to solve in the light of his own circumstances. The point in it all is that shop improvement features are but tools for producing better shop results, and are not sections of the millenium.

IRON AND STEEL IMPORTS AND EXPORTS.

Interest grows in the monthly statements of our foreign trade in iron and steel as our imports increase under the effort to keep pace with the country's phenomenal consumption. The figures below show that of the materials named the imports in March were over 35,000 tons or five times the amount in March of last year. For the nine months ending with March the total was nearly double that for the nine months ending with March, 1901. The imports of steel billets first became a real factor in March, having been but 2,235 gross tons in February. Pig iron imports, from 8,307 tons in February, rose to 17,184 in March, and at this rate the movement is of some significance. Iron ore is coming in at the greatest rate in years—82,148 tons in March, against 47,379 tons in March, 1901. For the nine months the imports of iron ore were 827,512 tons, against 532,951 for the nine months ending March 31, 1901. The statement of imports is as follows:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	March.		9 Mos. end'g Mar.	
	1901	1902	1901	1902
Pig iron	2,147	17,184	25,060	76,728
Scrap	127	1,855	14,126	19,131
Bar iron	1,048	1,596	18,283	19,254
Rails	.....	1,172	643	3,262
Hoop, band or scroll	.....	17	137	3,556
Steel ingots, slabs, billets and bars	77	6,569	6,967	18,468
Sheets and plates	121	618	1,382	6,465
Tin and terne plates	2,120	5,617	40,528	71,204
Wire rods	1,251	774	13,638	11,352
Wire and wire articles	221	352	2,140	3,190
Total	7,112	35,754	122,904	232,610

It will be noted from the above that tin plate imports have been increasing in a marked way.

The export statement for March given below shows little change from the conditions that have prevailed for months. A significant factor is the increase in structural steel, even under the scarcity at home, an evidence of the activity of the American Bridge Co. in extending its foreign business. The American Steel & Wire Co. likewise has held its foreign trade in spite of conditions at home, evidently counting that growing home competition in its products will make the foreign outlet increasingly important:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES.

GROSS TONS.

	March.		9 Mos. end'g Mar.	
	1901.	1902.	1901.	1902.
Pig Iron	3,306	1,716	245,373	49,337
Scrap	1,256	907	89,322	10,693
Bar Iron	2,908	809	18,738	7,304
Wire Rods	120	1,030	7,981	6,559
Steel Bars, (not Wire Rods)	2,096	984	71,528	13,909
Iron Rails	42	5	1,977	605
Steel Rails	35,409	8,030	258,254	146,777
Billets, Ingots and Blooms	2,181	93	129,813	2,430
Hoop Band and Scroll Iron	153	68	3,179	1,226
Iron Sheets and Plates	824	310	6,447	3,410
Steel Sheets and Plates	3,523	790	42,059	6,534
Tin Plates, Terne Plates and Taggers' Tin	49	194	353	545
Structural Material	3,109	11,695	48,666	51,071
Wire	6,912	6,757	51,637	69,146
Cut Nails	1,531	457	8,433	4,528
Wire Nails	1,406	1,850	14,028	13,478
Other Nails, incl'd'g Tacks	218	128	1,377	1,434
Total	67,043	35,829	928,635	388,986

Machinery exports have been less in some lines, somewhat more in others, as compared with last year. The aggregate value for the nine months was slightly less than for the nine months of the previous year. Exports of unclassified machinery for the two periods in question were valued at $14,902,807 and $15,976,712 respectively. The value of machinery and all iron and steel exports, excluding ore, for the nine months ending March 31 was $73,067,830 against $90,147,005 for the nine months ending March 31, 1901.

Mammoth Westinghouse Electric Plant.

The Westinghouse Electric & Mfg. Co. has decided practically to double the capacity of its plant by the erection of another building nearly 1,800 feet long and 230 feet wide. The building will be divided into three bays, a high central one and two lower ones. The machinery to be installed will be almost a duplicate of that in the present electrical works and the product will be about the same. Contracts for the erection of the building were awarded to the American Bridge Co., about 9,000 tons of structural material being required. The Westinghouse Machine Co. is also erecting an addition to its machine department, while an immense foundry is already under way at Trafford Park.

Bar Iron, Tin Plate and Sheet Scales Ratified.

The Amalgamated Association, in convention at Wheeling, W. Va., ratified the action of the executive officials of the Association in signing the bar iron, tin plate and sheet scales for the year ending June 30, 1903. A fight was made against the ratification of the action of the officials, but the Shaffer faction predominated and succeeded in securing endorsement of this action.

The annual convention of the Tinplate Workers' International Protective Association will be held at New Castle, Pa., commencing with Tuesday, May 6. The American Tin Plate Co. has offered the tin house workers the privilege of signing the same scale for the year ending July 15, 1903, as they have at present, and it is probable that the proposition will be accepted in convention.

Core Makers' Strike in Pittsburg.

(Special Telegram.)

PITTSBURG, April 30.—Coremakers in nearly all the foundries in Pittsburg and vicinity have gone on a strike, demanding an increase in wages from $2.75 to $3 a day. The demands were to have been effective last week but the men only went out yesterday and today. It is not believed that the strike will last long, as the foundrymen are a unit against granting the demands.

NATIONAL METAL TRADES ASSOCIATION OFFICERS.

At the recent convention of the National Metal Trades' Association held at Cincinnati, new officers were elected, and three out of the five names that now appear on the official list are changes from the list of last year. Victor H. Olmstead, commissioner and secretary, was re-elected and E. F. DuBrul, of Cincinnati, who was second vice president last year, was elected first vice president.

The new president is S. W. Watkins, of the Christensen Engineering Co., Milwaukee. He has had a prominent part in the work of the association almost from its inception and last year was on the administrative council, being also a member of the committee which had in hand the reorganization of the association. His work in committee and his participation in the discussions of the various conventions have marked him as practical, progressive and alive to the value of associated action by manufacturers, particularly under the conditions surrounding the machinery industry today.

E. F. DuBrul, the new first vice president, is one of the youngest men in the association, and at the same time one who has shown the keenest interest in the organization of manufacturers having like interests. He graduated from college in 1892 and for two years took post-graduate work in economics at Johns Hopkins University. He had previously taken a course of two years at law. Probably more than the average manufacturer, Mr. DuBrul has acquainted himself with the history of industrial and social movements, and on the organization of the National Metal Trades' Association he needed no urging to identify himself with its work. The specialty of the Miller, DuBrul & Peters Mfg. Co. is cigar and cigarette machinery. The firm is now marketing a machine that makes 600 cigarettes 3 inches long in a minute.

A. H. Bullard, the second vice president of the association, is secretary and treasurer of the Bullard Machine Tool Co., of Bridgeport, Conn. He is the representative on the executive board of the N. M. T. A. of the important machine tool interests of the New England States.

N. B. Payne, the new treasurer, is like Mr. DuBrul, one of the youngest of the association's members. He was born in Corning, N. Y., in 1872, and has been in the engine business for 12 years. He is general manager of the Payne Co., of Elmira, N. Y., and vice president of the Payne Engineering Co., of New York City. He was on the administrative council of the association last year.

Victor H. Olmstead, re-elected commissioner and secretary of the association, has had large experience in departmental work in economic and statistical lines at Washington. He rendered important service in connection with the Cuban census. He was chosen for his present position on the resignation of Henry F. Devens in 1901.

S. W. WATKINS, President.

E. F. DUBRUL, 1st Vice President.

N. B. PAYNE, Treasurer.

The Dunkirk, N. Y., plant of the American Locomotive Co., is filling an order for 30 switching engines for the Lake Shore & Michigan Southern railroad at the rate of two engines a day.

SOUTH CHICAGO STEEL WORKS.

(Special Telegram.)

CHICAGO, April 30.—Parties connected with the project to build a steel mill on the property of the South Chicago Furnace Co., on the Calumet River at South Chicago, have as yet no details to give out regarding the enterprise. It has not developed beyond the initial stages. The Deering Harvester Co., of this city, who are reported largely interested in the enterprise, have purchased the Kinney-Hawkins-Crosby mine on the Mesabi Range, acting, it is stated, for the promoters of the steel plant project. The Deering company has operated a rolling mill at its works for several months, having a capacity of 1,000 tons of angles, channels, rounds and flats a month. The South Chicago Furnace Co. is building a second blast furnace on its property and a third blast furnace is being considered in connection with the steel plant.

Decision in the National Tube Co.-Eastern Tube Co. Suit.

The State Circuit Court, sitting at Zanesville, O., last week, rendered an important decision in dismissing the petition of the National Tube Co., of Pittsburg, to restrain the Eastern Tube Co., of Zanesville, from using certain patterns of wrought pipe making machinery in the construction of machinery for its plant. Suit was commenced in both Pennsylvania and Ohio, but the Pittsburg courts dismissed the petition and did not grant a restraining order. In passing upon the petition the Ohio court made some rulings regarding property rights in patterns and we have made the following abstract: The court holds that patterns are not a trade secret. The suit was brought to restrain the defendant company from using certain patterns for castings on the ground that they are a trade secret. The plaintiff also asks that a receiver be appointed to take charge of the patterns. The court stated that the matter turned upon the question whether or not the patterns are a trade secret. If they are, the plaintitff is entitled to an injunction. If not, the plaintiff is not entitled to this protection. A trade secret was defined as a plan, process, tool, or mechanism known only to the owner and to those in his employ to whom he finds it necessary to confide his secret. It is not covered by a patent right. Nuttall was the authorized agent of the defendant company and as such procured the patterns. The court does not believe that the directors of the defendant company had knowledge of the way in which Nuttall secured the patterns.

The employers owned the patterns, but not the idea. The patterns are the result of the combined knowledge of the men in the employ of the corporation and were not ideas of the employers, who bought the use of the men's brains, but not the brains. If there was an individuality in the patterns there was not a trade secret.

The Eleanor Iron Co., of Norway, Mich., has been incorporated with $1,000,000 capital for the purpose of reopening and operating the Appleton mine on the Menominee range.

PERSONAL.

John Offut, formerly connected with the McKeesport, Pa., plant of the National Tube Co., has been appointed superintendent of the Ellwood City, Pa., plant of the National Tube Co. He succeeds O. T. Adams, recently resigned.

W. C. Marbon, a file manufacturer of Birmingham, Eng., visited all the large file manufacturing plants in this country during the past two weeks for the purpose of finding machinery that will replace hand work in the manufacture of files. He will return to England shortly.

Paul L. Wolfel, chief engineer of the American Bridge Co., and Albert Major, president of the company, spent last week in Pittsburg looking over the plans for the centralization of the company's plants at Economy, Pa.

A tour of inspection of the plants of the American Steel Hoop Co. and the National Steel Co. in the Mahoning and Shenango Valleys was made by the following officials last week: W. B. Dickson, second vice president of the United States Steel Corporation; W .E. Corey, president of the Carnegie Steel Co., National Steel Co. and the American Steel Hoop Co.; Messrs. Dinkey, McCague, Kerr, Hunt, Jenks and McCoombs.

Charles A. Lindstrom, formerly chief engineer of the Chicago & Alton railroad, has been appointed chief engineer of the Pressed Steel Car Co.

A number of changes among the operating officials of the iron and steel plants at Youngstown, O., will occur on May 1. Harry Parrock, superintendent of the upper mills of the American Steel Hoop Co., has been appointed superintendent of the Brown-Bonnell plant of the Republic Iron & Steel Co. George M. Summers, superintendent of the Brown-Bonnell plant of the Republic Iron & Steel Co., has been appointed superintendent of the Valley mill of the same company. George Huggins becomes assistant superintendent of the Brown-Bonnell plant. George H. Lowe, formerly superintendent of the Valley mill of the Republic Iron & Steel Co., has accepted the superintendency of the Muskegon, Mich., plant of the American Rolling Mill Co.

At the annual meeting of Jones & Laughlins, Ltd., Pittsburg, Pa., held last week, officers were re-elected as follows: B. F. Jones, chairman; Willis L. King, vice chairman; Irwin B. Laughlin, treasurer; William C. Moreland, secretary; William L. Jones, general manager, and Thomas K. Laughlin, assistant treasurer. The board of managers elected consists of B. F. Jones, Jr., Willis L. King, Irwin B. Laughlin, William C. Moreland, William L. Jones, James B. Laughlin, Roland Geary and Thomas O'C. Jones.

George Westinghouse, Jr., and H. S. Loud, general manager of the British Westinghouse Electric Co., of Manchester, Eng., sailed for England on April 30 to attend the starting of the great plant at Manchester.

Harry G. Hudson, master mechanic of the Big Four railroad, with headquarters at Wabash, Ind., has resigned to become general manager of the plant of the Alliance Steel Casting Co., Alliance, O.

At the regular quarterly meeting of the Allis-Chalmers Co., of Chicago, P. W. Gates, president of the Gates Iron Works, Chicago, was elected a member of the board of directors to fill the vacancy caused by the death of William L. Elkins, Jr., of Philadelphia, Pa.

George Whiting, who has been long associated with Scully Steel & Iron Co., Chicago, Ill., has resigned to engage in business for himself under the firm name of George Whiting Co., 428 N. Halsted St., Chicago, for the manufacture of all kinds of punching and shearing machinery and bending rolls.

The Eight Hour Day at Blast Furnaces.

The executive committee of the National Association of Blast Furnace Workers, at a meeting held at Youngstown, O., last week, decided to give the furnace operators until June 1 to accede to their demands for an eight-hour day instead of the present 12-hour day. About a month ago the workers decided that their demands must be granted by May 1, but inasmuch as the operators were not officially notified no attention was paid to the matter. The extension of time is believed, however, to be due to the weakness of the organization as the men were by no means a unit in favor of the shorter day. Meetings of the blast furnace workers were held at Braddock, Pa., on Saturday, April 26, for the purpose of organizing local unions at the Edgar Thomson and Duquesne plants of the Carnegie Steel Co. The organizers claim to have been very successful in organizing several locals.

A. S. M. E. Meeting at Boston.

The American Society of Mechanical Engineers will hold its 45th annual convention in Boston, May 27 to 30 inclusive. The regular sessions will be in the Henry L. Pierce Building of the Massachusetts Institute of Technology. Among the papers to be read are the following:

"Proposed Standard for Machine Screw Thread Sizes," by Chas. C. Tyler, Pittsburg.

"A Method of Determining Temperature of Exhaust Gases in Combustion Engines," by R. H. Fernald, Nw York.

"Working Details of a Gas Engine Test," by R. H. Fernald, New York.

"Liquid Fuel Combustion," by Chas. E. Lucke, New York.

"Mechanical Stokers for Locomotives," by Fred. H. Colvin, New York.

"The Flying Shear," by V. E. Edwards, Worcester, Mass.

"A Swiveling Joint for a 16-inch High Pressure Steam Main," by R. E. Curtis, Boston.

"Improved Indicator Cock for Engines," by Albert K. Mansfield, Salem, O.

"A Die for the Cold Working of Sheet Metals,' by John D. Riggs, Pittsburg.

"Repairing a Broken Cylinder," by H. M. Lane, Scranton, Pa.

"Final Report of the Committee Appointed to Codify and Standardize the Methods of Making Engine Tests."

"Specifications for Steel Forgings, Steel Castings and Steel Boiler Plates," by W. R. Webster, Philadelphia.

"Tests on Steam Pipe Coverings," by Geo. H. Barrus, Boston.

At the annual meeting, held April 23, of the shareholders of Ludwig Loewe & Co., of Berlin, Germany, rifle and machine tool manufacturers, the directors of the company were criticized for their expensive policy, to which the complainant attributed the reduction of the company's dividend for this year to 12 per cent, after having paid 24 per cent in dividends yearly for five years. Replying to this criticism the chairman said the policy of the company was dictated by the necessity of meeting American competition in machine tools, and that consequently an expensive new plant had been installed and new methods introduced. The Americans, he continued, had shown they were able to sell machine tools in Germany cheaper than the cost of production there. Engineers and masters had, therefore, gone to the United States to study the American method of manufacture and purchase an American equipment. Herr Loewe said he had found it necessary to adopt American social labor conditions, which rest upon machine production, namely, high wages, comfortable and well lighted buildings and the hardest work consistent with health.

The Pittsburg office of the Brown Hoisting Machinery Co., of Cleveland, has been awarded the contract for installing the latest improved Brown type of ore handling machinery at the three new furnaces of the St. Clair Furnace Co., Clairton, Pa., one of the subsidiary companies of the Crucible Steel Co. of America. The McClintic-Marshall Construction Co. has the contract for erecting the trestle work over the ore bins. The trestle will be 360 feet long with 12 separate spans. About 1,500 tons of steel will be used in the construction of this work.

The Soho furnace of Jones & Laughlins, Ltd., Pittsburg, will be blown out shortly to receive a new lining. An automatic skip hoist will also be built and the furnace will be made modern in every way.

The Hoefinghoff & Laue Foundry Co., Cincinnati, O., have installed a new 15-ton 50-foot span, 3-motor electric traveling crane, manufactured by Northern Engineering Works, Detroit, Mich.

Charles Churchill on the Foreign Machinery Trade.

Charles Churchill, head of the well-known corporation of Charles Churchill & Co., Ltd., of 9-15 Leonard street, Finsbury, London, E. C., and the pioneer in the introduction of American machinery abroad, particularly in Great Britain, gave a representative of *The Iron Trade Review* an interesting interview, at his New York headquarters, No. 23 John street, on Monday last. Although nearing the allotted age of three score and ten, Mr. Churchill shows none of the infirmities of age. He was born in Connecticut but has been a resident of England since 1862. He has lost none of his American traits, and there is not a trace of English accent in his speech.

"My visit to this country," said Mr. Churchill, "is not connected with any particular enterprise. I came primarily to see my mother who is fast approaching her 90th year. Concerning American machinery abroad, I can only bring reports of the most gratifying and hopeful kind. Thirty-five years ago when I started to introduce it, I was told that American rubbish—that was the name given American machinery then—was not wanted in England. In fact, my initial work in that direction was beset with so many difficulties, that I despaired of ever seeing the day when I or others would overcome them. Today, however, American machinery, so far as popular favor is concerned, is on a parity with any product of American manufacture you can name. The prejudice which one time existed against it has so completely disappeared, that you can say not even a semblance of it remains.

"Perhaps the best proof of that fact that I could produce is the business my own house is doing. In the past five years, we have done a business of some $4,000,000, or in other words of $800,000 per annum. Our business in the past year has been the largest I have seen done in the 40 years I have been in England; and looking at the outlook for the present year, I can see nothing but encouragement to the same extent. Bear in mind, I am speaking to you in a most conservative strain. I am not indulging in 'iridescent dreams,' to quote the words of an American statesman.

"To meet the increasing demands of our business, we have been compelled to maintain large branch offices in Birmingham, Manchester, Newcastle-on-Tyne, and Glasgow. At our home office we always keep at least $150,000 worth of American machinery on stock, and we keep a good stock on hand also at our branch offices. Altogether I should say we have American machinery employed to the extent of at least $300,000.

"From information in my possession, I should say that there are at least 300 plants in Great Britain equipped with American machinery. Scarcely a day has passed since the Boer war broke out two and a half years ago, that the Government has not been a purchaser of it. Only recently, for example, the Government purchased several American gas furnaces for the London Mint, to be used in annealing coins. Just before I left, an order for 50 gas furnaces of American make was placed. They will be installed in the Woolwich Arsenal. Not long ago, the Government also gave orders for American machinery, varying from big lathes for ordnance work down to the smallest wire drills for making cartridge fuses.

Among private British manufacturers, American machinery was never held in higher favor than now. The sales we have made of late, and the orders we are now executing, afford convincing testimony on that point. The large Glasgow Engineering Works, the Oldbury Carriage Co., and the new plant at Rugby of the British Thomson-Houston Co.—a concern, by the way, which is controlled by the General Electric Co., of New York—are a few of the establishments, which seem to have taken a fancy to equipment of American make, judging by the orders they have recently given."

When asked if the orders were confined to any particular kind of machinery, Mr. Churchill replied:

"Far from it. For instance, we handle drilling, planing, shaping, grinding and slotting machines of many makes, as well as tools of every description. A glance at our sales book would show that our orders cover all of these in general, and none in particular. The business in American electrical equipment, which we do not touch, has grown so largely that many firms devote their attention to it alone."

Concerning the outlook for American machinery abroad, Mr. Churchill said: "It could not possibly be brighter. When I left England, the prospects of an armistice being declared in the Boer war were so good that I was surprised on my arrival here that it had not been effected. However, the war is over, so far as actual fighting is concerned. The Boers are in no position to continue it. Assuming that the war is over, of shortly will be, I look for increased activity in manufacturing lines, particularly in Great Britain. That American machinery will forge to the front is an assurance that can be given, without the slightest hesitation."

Referring to German competition, Mr. Churchill said: "American manufacturers of machinery need not have any worriment on that score. The fact of the matter is, there is little or no sale for engineering tools of German make in England. There is a prejudice against them, and I know of several cases where orders given to German houses were canceled, and immediately given to representatives of American houses."

Mr. Churchill was asked if he had any suggestions to offer to American manufacturers, with the idea of increasing their trade abroad.

"Only this. They cannot keep their products to the front too much. That there is a field for them abroad is certain. Why, there are a hundred concerns in England alone who would gladly act as representatives of American machinery manufacturers. They see the possibilities before them, and are anxious to avail themselves of them. This is especially true, so far as South Africa is concerned.

"At the American Exhibition, which opens in the Crystal Palace, London, in the latter part of May, many of the products of American machinery manufacturers will be on exhibition. Our firm has contracted for a large space, and we will have a good stock on hand. Some of the American machines will be kept running daily, in order to give a practical demonstration of their usefulness."

Speaking of the impressions he has formed since coming to the United States on this visit, Mr. Churchill said: "I have been gratified by the evidences of prosperity I have seen around me. In the week I have spent in New England, I have visited New Haven, Providence, New Bedford, Hartford, Boston, and Worcester, and all of the plants I have visited have all the business they can take care of. I have tried to expedite the execution of some of the orders we have in them, but my efforts have not been marked with any great success."

As to his plans for the future Mr. Churchill said: "I sail for England on May 24. In the meantime I will visit Pittsburg, Philadelphia, Cleveland, Cincinnati, Chicago, Springfield, Ill., and Franklin, Pa. If I can find the time to do so, I will visit Wilmington and Baltimore also."

Import Duties on Iron and Steel.

Owing to the increasing imports of iron and steel commodities, and the certainty that the import movement will continue on the present scale for some time, we present herewith a schedule of the duty on the most important of the various forms of material now being brought into this country from Germany and England:

Pig iron, ferro-silicon, spiegeleisen, and ferro-manganese	$4.00 per ton
Boiler or plate iron and steel, except saw plate and crucible plate or steel thinner than No. 10, w. g., sheared or unsheared, and skelp iron or steel, sheared or rolled in grooves—Valued at 1 cent per pound or less	.5c. per lb.
Valued above 1 cent per pound and not above 2 cents	.6c. per lb.
Valued above 2 cents per pound and not above 4 cents	1c. per lb.
Rails	$7.84 per ton
Wire rods, not smaller than No. 6, w. g.—Valued at 4 cents per pound or less	.4c. per lb.
Steel ingots, billets, bars, or castings—Valued at 1 cent per pound or less	.3c. per lb.
Valued at 1 cent per pound and not above 1.4 cents	.4c. per lb.
Valued above 1.4 cents per pound and not above 1.8 cents per pound	.6c. per lb.
Beams, angles, channels, and all other structural shapes	.5c. per lb.

The Pittsburg Construction & Engineering Co., Pittsburg, Pa., has increased its capital stock to $50,000 to provide for the immense amount of increased business now being done. The company has also recently erected its own factory building at Liberty Ave. and 27th St., where the main office is now located.

Workshop Records in Cards and Files.*

BY GEORGE PARKER.

Much has been written lately concerning American competition in every branch of engineering, and many explanations have been offered as to how they are able to undersell British firms; but, so far as the writer is aware, their much more universal knowledge and appreciation of the benefits accruing from a thoroughly efficient system of internal organization has never been mentioned in this respect. Yet may not this be an important factor in their success?

In America "the principles of the organization of workshops, including methods of ascertaining and keeping costs, etc.," are taught at many of their technical colleges, and in addition some of their best known firms have published full descrip-

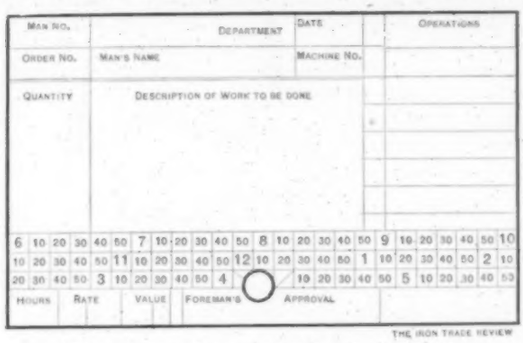


FIG. 1. JOB ORDER CARD (1). SIZE 5 X 3 IN.

tions of their methods of organization, so that all who care to read may benefit thereby. In Great Britain, however, this subject has received but scant attention, little or no attempt being made to teach the young engineer anything of the commercial side of his profession, and most firms in the country believe in keeping their methods of organization rigidly to themselves.

This reticence and conservatism on the part of British firms is greatly to be deplored, for it is only by being able to make comparisons that the best methods can be arrived at. The advantages to be gained by making such comparisons far outweigh any personal considerations, and in no case need involve the publication of trade secrets or other matters of a private nature.

A modern industrial establishment has been aptly compared to the human body, and there are many points of resemblance, the manager being the brain, the workshop records the nerves, the machinery the bones, and the workmen the muscles. The

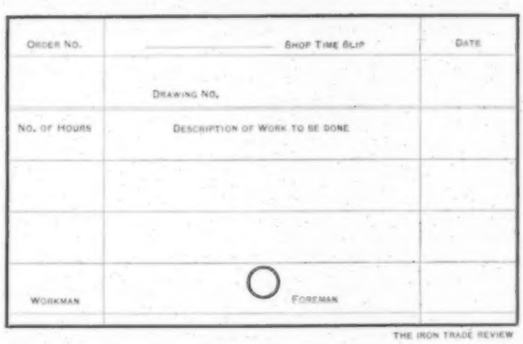


FIG. 2. JOB ORDER CARD (2). SIZE 5 X 3 IN.

bones and muscles are dependent on the brain for the initiation of every movement, and in the same manner the employment of the machinery and the workmen is initiated by the manager. In order that these movements may be properly controlled it is necessary that the nervous system should be in proper order, therefore it is a matter of paramount importance that there should be a thoroughly efficient system of workshop records in use in the factory.

So long as a firm continues to make large profits the need of efficient workshop records does not come acutely home, but as soon as competition begins to tell, and these profits decrease and perhaps disappear altogether, the question naturally arises: How and where, if possible, can the cost of production be reduced? This question a thoroughly efficient system of workshop records alone can satisfactorily answer.

A system of workshop records should have three objective points in view, viz.:—

(1) The tracking of the state of progress and cost of products through the factory.

(2) The lessening of the costs of production; and

(3) The determination of a price at which the factory products may safely be offered on the market;

and in order that these may be accurately arrived at the following record must be kept:—

(1) Records of orders for work to be done;

(2) Records of labor or work done;

(3) Records of material, raw, in progress, and finished; and

(4) Records of establishment charges.

Records of Orders to be Done.

These, so far as the factory is concerned, initiate with the manager, who, on receipt of an order from a customer, by the

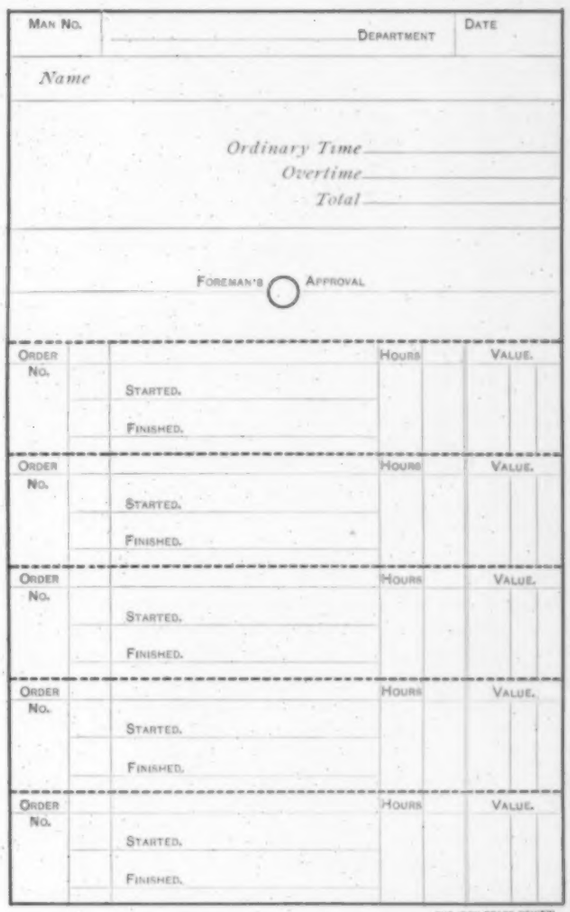


FIG. 3. COUPON CARD. SIZE 8 X 5 IN.

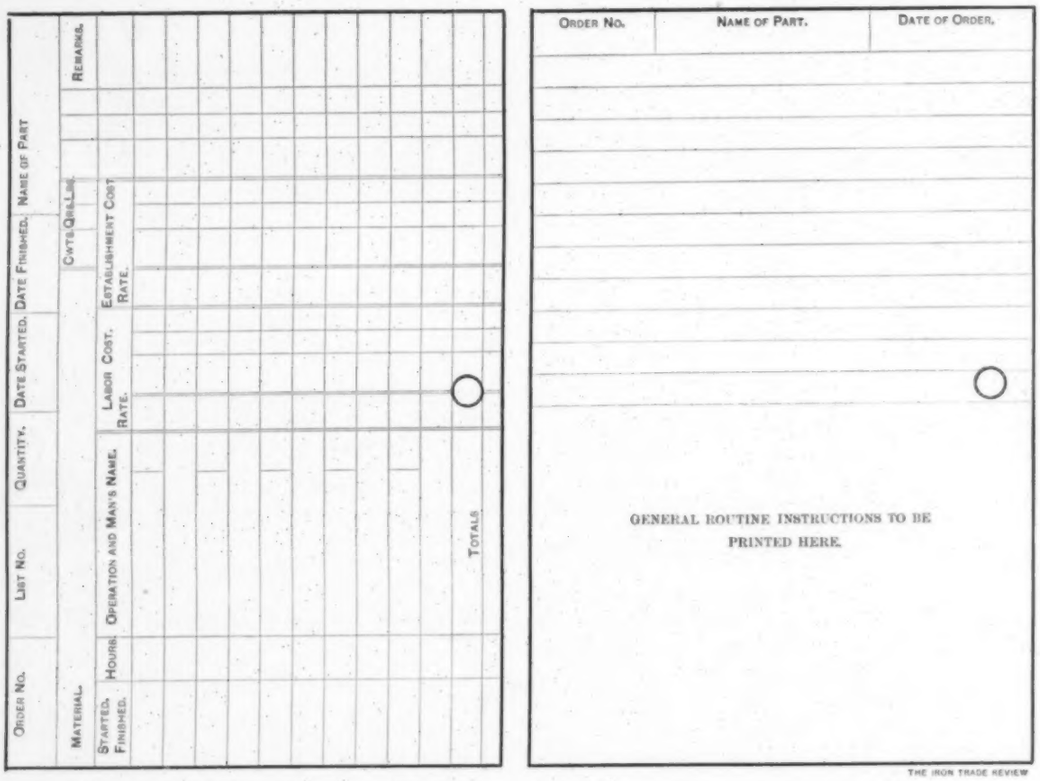
issue of production orders to the different departments, authorizes the work to be done by each.

As nearly every firm has a different system of dealing with these orders, it is quite impossible to do more than sketch the general procedure. The most usual plan is to provide an order book, in which every order is entered as received and its consecutive number put opposite, together with any necessary reference to the estimate book, tender book, or letter book. This book is accessible only to the manager and his clerk, no one else being allowed to see it, and its precise form will vary with the class of work turned out by the factory. The first step necessary for putting an order into effect is to give instructions to the head draughtsman to prepare or collect the

*Paper read before the Northeast Coast Institution of Engineers and Shipbuilders (Great Britain), March 21, 1902.

drawings required. This should be done in writing, either by letter or by direct entry in the drawing-office order book. In the drawing office the necessary drawings and working lists are prepared, so as to provide the officials having charge of the work with full instructions for fulfilling the order down to the smallest detail. A copy of the working list, which is really a specification of everything required on the order, is sent to the manager, to the storekeeper, and to each foreman who will be employed on the work. The manager has his copy written into the order book, where space is provided for it, and the progress of the work noted. The storekeeper, on receipt of his copy, requisitions the office for all parts, etc., which are not in stock, and they are then ordered from outside in the usual manner. In addition to the working list copy, general instruction sheets are often issued to the foremen, giving full particulars of the work to be performed and the time in which it must be completed.

The above is briefly a very usual method of procedure, varying in detail to suit different classes of manufacture. Most managers will agree that it has many shortcomings, yet there are many firms much worse off in this respect.



COST SIDE. REVERSE SIDE.

FIG. 4. COLLECTION ORDER CARD. SIZE 6 X 4 IN.

Where cards are used for the purpose of recording orders the procedure may be as follows: On receipt of an order from a customer it is entered on a card, which is filed in the manager's office. From this card other cards called production orders are made out, one for each piece or service which is required to make up the order, commencing with the drawings. In the drawing office a list of pieces required to complete the order is made out, this list being required to assist in making out the other production order cards, which may be of different colors in order to facilitate reference. These cards are sent into the shops with the drawings and follow the work from department to department, having the date of their receipt by and transfer from each department indorsed on them. Where separate cards are used to order each part, they may also be made to collect the cost, as will be described later. The records of orders from the foremen to the men really form part of the "Records of Labor," and will be referred to under that heading. The writer is afraid that but a faint idea of the procedure under this heading has been given, but it is difficult to do more while only dealing with general methods.

Records of Labor.

(1) The record of each man's time of arrival at and departure from work.

The oldest method of getting this information is probably by means of the giving out and return of the men's time boards as they pass the time office window on arrival and departure. These boards being numbered consecutively, those left in the office after the gate is closed denote the men that are absent. On leaving work each man hands his board in at the time office, it being a fixed rule—no board no pay. This method has been in use for the past 50 years or more and is still used by some firms.

The next method to be adopted is what is now universally known as the "check system." There are several modifications of this system, the following being a very usual one. Each man on leaving work at night is given three different shaped brass checks, numbered 1, 2, 3, as well as bearing the man's distinctive number. No. 1 is given in before breakfast at the time office, No. 2 after breakfast, and No. 3 after dinner. These checks are delivered to the men by the timekeeper from a check board, accessible only to him, where they hand in sequence. If a man leaves the factory without his checks, he cannot obtain them again without a satisfactory explanation. Sometimes a fourth check is used for overtime.

In both the "board" and "check" systems a time book is necessary to record the actual time each man has worked per day. This book is ruled with columns for each day of the week, and the time entered therein for each section of the day. There are various methods of doing this, some preferring to use marks of some kind instead of figures. Thus, in Great Britain the day is usually divided into three sections, in which the working hours may vary at different times of the year, but the exact duration of which is always known to the timekeeper; then three strokes may be used, one for each section of the day, / for time before breakfast, | for time after breakfast, and — for time after dinner, a complete day being represented by a triangle. Owing, however, to the difficulty of convincing the men in the case of dispute, this method is

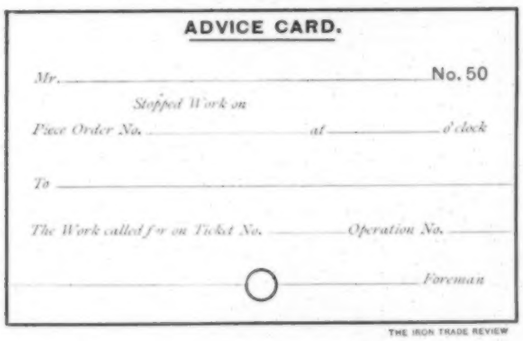
not to be recommended. Where figures are used, each day column is divided into four sections, the actual hours worked being entered therein, and the fourth section reserved for overtime.

There are now several time recording clocks on the market which greatly facilitate the keeping of these records. By the use of one of these clocks the time book and its consequent clerical labor is entirely done away with, each man making his own record with the aid of the clock as he arrives at and leaves the factory. The following is a list of most of the time recorders now on the market, together with a brief description of their respective abilities:

The Rochester Card Recorder.—This clock records on cards, each man being provided with a card which he places in a slot in the clock on arrival at, and departure from, work, and the time is printed on the card by pushing down a lever. The same procedure is observed in dealing with the cost cards, the men printing their time of commencing and finishing each job by the aid of the clock.

The Bundy Key Recorder.—This clock records on a strip of paper inside of the clock. Each employe is provided with a key, which is inserted in the clock on arrival at, and departure from, work. The objection to this system is that the records are in the order in which they are made and consequently awkward for reference.

The New Pointer.—This clock is provided with a dial numbered round its circumference and a movable pointer in the center. The men on arrival at, and departure from, work move the pointer round to their distinctive numbers and press, and the clock prints the time on a strip inside. This


ADVICE CARD.

Mr. _____ No. 50

Stopped Work on

Piece Order No. _____ at _____ o'clock

To _____

The Work called for on Ticket No. _____ Operation No. _____

_____ Foreman

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FIG. 5. ADVICE CARD. SIZE 5 X 3 IN.

machine overcomes the objection raised against the Bundy, the records being in consecutive order.

The Autograph.—This clock records on a strip of paper inside on pressing a lever. Each employe pulls down the lever, which opens a slide disclosing the paper strip, signs his name, and the clock prints the time opposite.

The Dial Recorder.—This clock is similar to the New Pointer, the records being made on a circular piece of paper.

The Simplex Time Recorder.—This clock records on paper strips inside, and is provided with numbered buttons, which, on being pressed, perforate the paper strip, and thus record the time.

The "Dey" Time Register.—This clock is similar in many respects to the New Pointer described above, the men pressing the pointer when over their distinctive numbers and record the time on the strip inside the clock.

The Stockall Time Recorder.—This clock is similar in many respects to the Rochester described above, and it is claimed as an advantage that the card, when placed in the slot for recording, disappears out of the sight and control of the workman.

The Standard Time Stamp.—This stamp is provided with clock mechanism and it prints the date and time of day. It is chiefly for the use of foremen in stamping the job tickets.

(2) The record of the allocation of each man's time to the proper processes or jobs on which he has been employed.

There are many different methods of making these records, the time board, with its modifications, being the oldest and the one in most general use in this country. In this system each man is given a time board (which may be a wood board painted white, a slate, a card, or a slip of paper) on which he is supposed to record how he has spent his time during the day. This is examined, and, if correct, signed by the foreman and handed in at the time office every night.

The result is, that as the majority of men have a great aversion to clerical work of every description, they leave the filling in of their time until the last moment; consequently the details furnished are in most cases little better than guess work. It is quite impossible for the foreman to detect errors unless they are of a very glaring nature; in fact, the most he can do is to see that the proper jobs are entered on the time board; thus one job often benefits at the expense of another, and heavy losses are incurred on future work through unreliable estimates based on these figures, or work lost owing to too high a price being quoted. These time boards are transcribed into a book usually called the work book, then, after being agreed with the time book or clock records as to total time, are used in making up the wages analysis, from whence they are posted to the debit of the different orders in the cost ledger.

There are three distinct systems of using cards for this purpose, each of which possesses certain advantages.

(1) The job order system, in which a separate card is used for each job on which a man works. Two examples of job order cards are given in Figs. 1 and 2. The first of these cards is used as follows: On entering the shop in the morning each man is furnished with a card, representing the job he is busy on or is to proceed with, which he perforates at the time of commencing work and hangs in front of him. If the foreman wishes to give a man a second job before the first is fin-

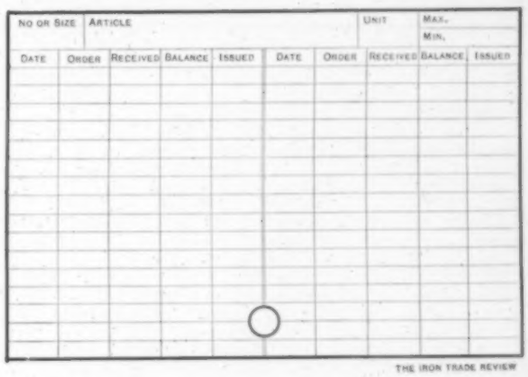


FIG. 6. STORES' LEDGER CARD. BOTH SIDES ALIKE. SIZE 6 X 4 IN.

ished, he fills in the order number and operation to be performed on a second card, which is hung next under the one in use. When a job is finished its card is examined by the foreman, who approves it by signing it or preferable by punching it with a ticket punch. The second card is used in identically the same manner, except that the times of commencing and finishing are to be entered in writing either by the man himself or by the foreman. If by the foreman, a time stamp may be used, in which case each foreman should be provided with one for the purpose.

(2) The coupon system, which is really the old time board combined with the advantages of the job order card. An example of this card is given in Fig. 3, and it will be observed that it is provided with five perforated stubs or coupons for five separate jobs. This card is used in exactly the same manner as the old time board, with the exception that the times of commencing and finishing each job is stamped on its respective coupon by means of the foreman's time stamp. On arrival at the office the separate job charges are torn off at the perforations and sorted to order numbers, and the total time chargeable transferred direct to the cost summary, without the need of the work book or wages analysis. After this the coupons are available for comparative cost purpose of every description.

(3) The collective or piece order system, in which a separate card is used for each member of piece of work, irrespective of the number of operations involved in its completion. In this system the card (see Fig. 4) may follow the piece of work which it represents through the factory and have recorded on it the time spent in the different processes

and operations performed on it, and, in addition, may be used as the means of transmitting orders as described under the heading of "Records of orders for work to be done." The great objection to this system lies in the difficulty of agreeing the men's gate time with the time charged to the different jobs on which they have been engaged during the day. This difficulty, however, may be overcome by using advice cards and writing up the collective order card from them. The men have then nothing to do with the allocation of their time. The foremen are provided with advice cards (an example of which is given in Fig 5), and one is filled up every time a man finishes a job and commences another. These cards give the time (which may be stamped with a time stamp, and particulars of the job finished and the new one commenced) and are forwarded to the job clerk at stated intervals every day. The job clerk posts up the collective order cards from them and they are then available for agreeing the men's allocated time with their gate time. The collective order cards are filed when finished under the heading of the product of which they form a part.

Records of Material.

Speaking generally there are in all factories raw materials, materials in progress, finished parts, and assembled or completed products. A "rough store" and "finished store," it will be found, are, therefore, essential to getting accurate records, all material starting from the "rough store" and working its way to the "finished store" before being finally issued to the assembling room or erecting shop.

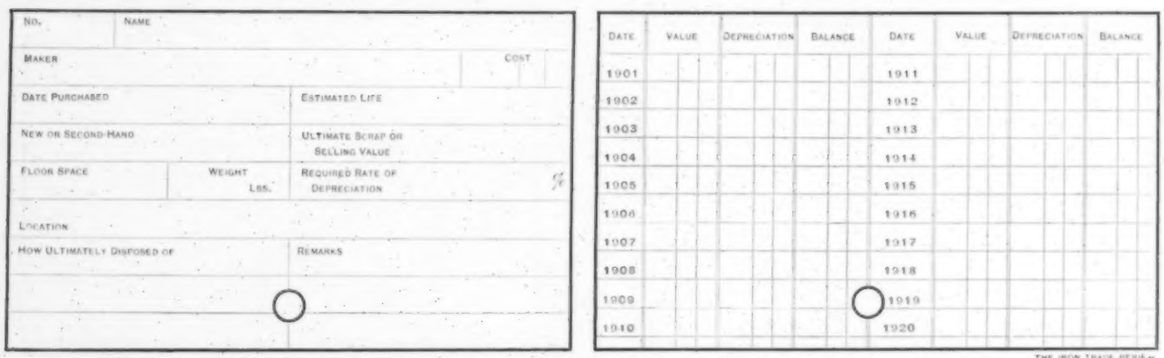
Raw materials are ordered as required through the office, and are received on arrival by the storekeeper, who is required to make an independent record of what he receives. This record is sent up to the office, where it is checked against the invoice and original order. A more general system than the above is for the invoice to be sent to the storekeeper, who is supposed to check it off with the material actually received, but this is a very loose system, especially as the storekeeper then knows exactly what material he has to expect, and there is consequently always a direct incentive to scamp the checking. Nothing should be given out by the storekeeper except on properly authenticated orders, such records being kept as will show to whom and on what account materials have been issued.

The most usual method adopted for keeping a record of raw materials is for the storekeeper to be provided with two books, named respectively "stores received" and "stores issued." In order to facilitate the checking of the invoices and the posting of the stores issued to the different orders two sets of these books are often provided for use on alternate days or weeks.

Raw materials are issued to the men as required on requisition orders, signed by the foreman, stating the quantity of material required and to what order it is to be charged. Each foreman is usually provided with a requisition book made up of alternate thick and thin leaves and used with a carbon sheet, so that a copy of each requisition always remains for reference. Material ordered specially for an order is often charged direct to the order in question without putting it through the "rough store;" but while this may seem to be a saving in clerical labor it may cause a great amount of trouble and worry in order to locate the material when it is required. Where there is a "finished store," practically the same procedure should be observed, the finished parts being received from the shops and issued to the assembling room or erecting shop. In cases where there is no "finished store," finished parts are sent direct into the erecting shop on completion, with the result that a great deal of confusion and worry is often caused when they come to be assembled.

The raw materials issued are posted to the debit of the different orders in the cost ledger either direct from the stores issued book or through the medium of a journal, in which latter case a considerable amount of clerical labor will be involved.

In order that the "rough store" may be worked with any degree of efficiency it is essential that a stores ledger should be kept, in which accounts should be opened for each class or kind of material stocked and the receipts and issues posted up from the stores received and stores issued books. This, of course, means a tremendous amount of clerical labor, but the advantages gained will in most cases far outweigh the extra expense incurred. Some difficulty will be met with in opening this ledge in regard to some of the items, such as waste, oil, tallow, etc., but as these are only chargeable to establishment charges account this difficulty may be overcome by the exercise of a little ingenuity and determination. In arranging the storerooms it will be well to remember the old adage, "a place for everything, and everything in its place," and have properly labeled bins and pigeon holes provided for storage purposes, for on these the efficiency of the storerooms will to a great extent depend.



FACE. BACK.

FIG. 7. INDIVIDUAL MACHINE CARD, SIZE 5 X 3 IN.

By the use of cards the stores received and issued books may be abolished entirely. All material received is recorded on cards (see Fig. 6), which are filed and sent into the office every day, where they are checked against the orders and the invoices, after which they are filed for the use of the stores ledger clerk. This ledger, consisting of cards filed in a cabinet, is kept in the office on the theory that if the storekeeper wants to know what is in his room he should look in the proper place and find it. Material is issued on receipt of card requisitions from the foremen, these cards also being filed and sent into the office every day for the information of the stores ledger clerk. The storekeeper, having thus no clerical work to perform except on the receipt of material, is able to pay much more attention to his ordinary duties. Another method is to provide a "material card cabinet" in the storeroom, and require the storekeeper to enter all issues on their proper order card, but this plan cannot be recommended, although it is undoubtedly better than using books for the purpose. In some cases, as a check on waste and carelessness on the part of the foremen, the storekeeper is provided with a list of everything required on each order and is required to honor the foremen's demands to the extent of this list but no further. Should any material be spoiled or lost the foreman must obtain an order from the office before the storekeeper will deliver the material.

No values are inserted on any of these cards at first, and the stores ledger is kept in quantities only. A card index file is kept in the office, showing the fluctuations in price of each commodity, a separate card being used for each, and the prices

at which they are to be charged varied accordingly at stated intervals. This makes the cost accounts of much greater value, as market fluctuations are at once apparent. As a check on the accuracy of the stores ledger records the stores ledger clerk is required to send to the storekeeper the names of several articles which are in stock, with a request for an actual count of each. This is done every day, so that in the course of a month every stock account is checked at least once.

Records of Establishment Charges.

Although the keeping of these records is often deemed a very simple matter, it is in reality very difficult to carry out properly. It may be done, of course, very simply by charging everything which cannot be charged direct to orders to an account in the commercial books called establishment charges account, but this will afford no information when it is desired to find out where these charges may be reduced. It is only by splitting establishment charges up to their composite items that this information may be arrived at, and it is in this respect that the practical utility of the modern system of workshop records will perhaps be most appreciated by manufacturers. In this country as a rule very little effort is made to subdivide these charges, although the "standing order" system is fairly well known, while in America they are split up into the minutest details, over 100 subdivisions being quite usual.

In the standing order system a list is prepared of the different headings under which all work done for the factory itself is to be charged, these headings being numbered and called standing orders, and records made by any of the methods already described for customers' orders. There are, however, many other items coming under the heading of establishment charges which are only obtainable from the commercial books, such as rent, rates, taxes, office expenses, etc.; or arrived at in arbitrary manner, like depreciation. In some businesses it is also advisable to keep the selling expenses entirely separate from the working expenses, especially where a firm manufactures largely for stock, and is, in fact, a dealer in, as well as a manufacturer of, its products.

The subject of depreciation is so important that it would require a separate paper of itself in order that full justice should be done to it, for on the manner in which it is treated very often depends the success or failure of a business. All firms recognize that depreciation must be provided for, but very few agree as to the amount which is necessary to cover it, or as to the manner in which it is to be computed. In this country the usual method adopted is to write off a certain percentage every year from plant and machinery (usually 5 per cent), from buildings (usually 2½ per cent), and from loose tools (usually 10 per cent), no attempt being made to depreciate any of these individually except in very rare instances, although that is a matter of the greatest importance. Thus, it is quite a common occurrence to find, in this country, machine tools in use 20 and 30 years old, firms being loth to part with them because their records don't show that their individual values have been written off. If a record of each machine tool was kept, showing the depreciation off every year, firms would be far more willing to get rid of old fashioned, and costly in upkeep, machine tools.

Individual records of buildings and machinery and plant may be kept either in books or on cards, but preferably on cards, as dead records can then be at once removed. In the case of many small tools a minimum individual value may be agreed, and those coming under it recorded in groups. An example of a plant record card is shown in Fig. 7.

Loose tools are a very important item, and the American plan of providing a tool room, or branch store, for their reception is beginning to be largely adopted in this country. This toolroom is provided with suitable racks for storing the tools and with grinders, etc., to keep them in working order, and is in charge of a skilled workman. Tools should never be issued to the shops without a record of the taker, and for this purpose the check system is often used. Each man is provided with five or six brass checks stamped with his individual number, one of which is given to the toolroom keeper whenever a tool is required, and the toolroom keeper places the check in the vacancy left by the tool in its rack. The check thus makes the man stand charged with the missing tool until it is returned to the toolroom and the man has his check returned therefor. The only objection to this plan is that the men are wholly at the mercy of the toolroom keeper, who is liable to place the checks in the wrong racks, and for this reason cards used as in a library are preferable. As a matter of accounting, loose tools are treated in a variety of ways, the safest being to write off all additions and replacements every year, letting the value stand the same from year to year until some marked increase or decrease is made.

After the total of establishment charges has been arrived at, it becomes necessary to consider how they are to be taken into account as affecting the cost of the different products turned out and commenced during the period which they cover. This leads to the consideration of the different methods of determining the oncost to be borne by the finished and partly finished products. In valuing work in progress for balance sheet purposes often no account is taken of oncost, and although this is undoubtedly an error on the safe side, it is nevertheless an error, and may seriously injure one year's profits at the expense of another's. Where the question of oncost is properly considered and scientifically dealt with, there is no reason why it should not be charged to the product in an equitable manner at each stage of its manufacture.

There are many different methods of determining oncost, but they all belong to one or other of three classes.

(1) By a percentage on direct or productive labor, based on past or current records.

This is the method in most general use in this country, although owing to its overburdening highly paid skilled labor and underburdening cheap unskilled labor, it gives in many cases far from reliable results. This disability may be somewhat minimized by adopting a different percentage for each class of work.

(2) By an hour rate based on the average number of hours of direct or productive labor.

This is the method usually adopted in America, and except in shops where there is a great diversity in the size and cost of individual tools it will be found to give very reliable results, the loss incurred on cheap labor as in the "percentage method," not having to be made good at the expense of work requiring dearer labor but less time. Some accountants and managers recommend that this rate should be recalculated every month, but this will generally be found to give more trouble than it is worth. Probably the best method of varying this rate is by a sliding scale based on the average number of men in productive work. This plan is used in several American shops, the foreman's time stamp being utilized to stamp the job cards with the number of men in productive work each day.

(3) By a machine hour rate, supplemented by an overhead hour rate for those charges which it is impossible to allocate to the machines.

This is far and away the most scientific method, for it enables the machinery used to be taken into account in costing work, and this is a most important advantage, especially now that machinery is becoming to be more and more used in every branch of industry. Many will object to this method as involving too many complications, and except in shops where there are both very large and very small machines it may hardly repay the trouble of installing it, although on the other hand the information afforded will be an undoubted advantage.

The Card System.

Having described applications of cards for various purposes, a brief description of the origin of the system will not be amiss.

The card system has been described as a method of recording, classifying, and indexing facts, figures, or names of every description by means of cards, uniform in size, arranged on edge in drawers or trays, according to some defined order, with projecting guide cards to facilitate immediate reference. The system originated in Boston, Mass., where is was used for the purpose of indexing library books and recording whether they were out on loan or not. Captain Henry Metcalfe, Ordnance Department, U. S. A., was probably the first to use cards entirely for workshop record purposes. He devised and introduced a system of card records in place of books

while in charge of Frankfort Arsenal, U. S. A., in 1881, and so far as the writer is aware his system is still in use.

Perhaps the greatest advantage which the card system possesses over books lies in the fact that, by making only one record on each card, the number of possible combinations is practically unlimited, and in addition, except for summary purposes, the record once made serves a variety of purposes without transcription. Writing of this advantage, Captain Metcalfe says: "Generally speaking, the lower in the scale of combination the unit is, the easier it is to treat it independently in forming such new combinations as may be required. This applies to many examples in everyday life. Take, for example, the printer's type, divided into single letters. How much better it lends itself to forming the great variety of words it is intended to multiply and preserve than if whole words or even their constituent syllables were cast as single pieces like the ideographic characters of the Chinese or the hieroplyphics of the old Egyptians? In fact, was not the germ of Guttenberg's invention not that of printing only, with which he and his associates are credited, although it is as old as the use of the signet ring, but the printing with movable letters?" This unity of record is invaluable for collecting and collating details of cost both for summary and departmental purposes. Take, for example, a steam engine. Each member or part has its cost properly inscribed on a card (or series of cards according to the exact method adopted), and the total of these cards (or series of cards) when collected forms a complete descriptive cost of the engine.

Points on Introducing a New System.

The adoption of more modern methods of organization and workshop record has probably been contemplated by most managers during recent years, but the absence of reliable information on the subject, together with the fear that work in the shops will be delayed owing to the men not being able to understand them, has undoubtedly deterred many from proceeding further with the matter. In America these difficulties have been overcome, even in shops employing men of different nationality. That being so, why should not the same thing be done here?

In designing a system of workshop records it is essential:

(1) That all orders in connection with the expenditure of labor or material should emanate from one central source.

(2) That all records of work done and expenses incurred under these orders should finally converge towards that same central source.

This central source is, of course, the office. Here all orders initiate and all records of their cost and progress find a final resting place.

The scope of each official's authority should be clearly defined, much confusion and bad feeling being prevented thereby, and until this is done it is impossible for any system to work smoothly.

If the card system is decided on, the best plan will probably be to introduce it by easy stages, starting with, say, the time records, and then gradually using it for all purposes of workshop record. It may, of course, be introduced in its entirety if preferred, in which case the books will have to be closed at an agreed point and the records transferred to the cards.

The exact methods to be adopted will depend to a large extent on the nature of the product turned out, and to some extent, as regards the time records, on the system of remunerating labor.

In working the system its value will, to a large extent, depend on the judicious issue of the cards. Thus, if costs are required to the smallest detail, separate cards must be used for each piece and each operation performed on it, but this is not often required, the collective order system generally giving all the requisite information.

In using the collective order system, which is the most suitable for marine engineers and the heavy trades, a separate card is used for each component part of the product. The advantages of this are twofold: first, it enables the card to follow the part which it represents right through the shops, going to each man who has work to do on it, and serving the purpose of ordering everything in connection with it; second, it gives the cost in detail, so that when a similar job comes in an estimate of cost may be made, even though there is some variation in details, by means of appropriate deductions and additions, which will be much more accurate than mere guesswork.

As an example of the number of uses to which these piece order cards may be put, it may be mentioned that the Bickford Drill & Tool Co., Cincinnati, O., who use this system, make them serve seven distinct purposes before using them for cost keeping, viz.: (1) They furnish the necessary authority for the ordering of material; (2) their receipt by the general foreman tells him that the piece is in the shop ready to be proceeded with; (3) their delivery to departmental foremen indicates the order in which the work is to be done; (4) their stay in the hands of the departmental foreman shows them exactly what work they have ahead; (5) their return to the stock clerk authorizes him to issue the material to the shop; (6) their appearance in the drawing office shows that the work has been taken out of the stores; and (7) their location in the job clerk's file signifies whether or not the work is actually in progress. On receipt of an order the job clerk makes out the requisite number of piece order cards from the list furnished by the drawing office. These are sent to the stock clerk, who forwards those for which he has the material in hand to the general foreman and orders the material required to fill those retained.

Having decided on the methods to be pursued in regard to direct expenditure, the method to be adopted for determining oncost remains to be decided on, and method No. 3 is undoubtedly the most reliable for marine engineers, especially where there is a large amount of repair work.

As regards shipbuilders, it will be found somewhat more difficult to introduce the card system. In fact, many managers will regard the advantages to be gained therefrom as questionable. Yet it is undoubtedly a great advantage to be able to follow the actual cost of each section of a ship during its progress, without having to wait until the ship's account in the commercial books has been dissected and the detailed cost taken out. This the card system will admit of being done, for by its use the records may be made as the work progresses, the cost of each section of the ship being shown on a card (or series of cards), which, being filed together, represent the total cost of the ship. Opinions differ as to the mode of determining oncost to be adopted by shipbuilders, but method No. 1 for all purely yard charges, supplemented by a rate in proportion to the tonnage or the cubic numbers of the ships turned out, will give reliable results. In addition to this the coal used may be kept separate and charged in proportion to the weight of steel or iron worked into the ships. Methods No. 2 and 3 are quite unworkable in a shipyard, as the majority of men are on piecework.

In conclusion, the writer ventures to hope that this paper may prove of interest to the institution and be the forerunner of many others on kindred subjects, for it is to this branch that attention will be most needed in dealing with foreign competition. The writer would also like to suggest that this institution should do something to promote the study of this most important oranch of the engineering profession, either by forming a debating section, so that members interested might meet and discuss and exchange views on the subject, or in such other way as the council might see fit.

Explanatory.

The following definitions of terms employed in the above paper were added by the author:

Assets.—Property of every description.

Balance sheet.—A summary or statement showing a firm's financial position at a given date.

Commercial books.—The books relating to the office accounting, such as the ledger, journal, and cash book, as distinguished from the factory books.

Cost of production.—The total expenditure incurred in the production of a commodity. This term is distinguished from prime cost in that the latter term does not cover the whole cost of production.

Depreciation.—The falling-off in value of machinery, plant, buildings, loose tools, and other assets, owing to wear and tear.

Factory accounting.—The systematic record of all transactions incidental to manufacture.

General and establishment charges.—The expenditure incidental to maintaining an industrial establishment in a proper state of efficiency, and which cannot be charged to any particular process or order.

Gross or total cost.—Prime cost plus oncost.

Job.—The amount of time spent by any particular workman on any particular piece or set of pieces.

Material.—That factor in the cost of production which represents the rough stores used in the manufacture of any article.

Oncost.—The proportion of establishment charges which it is calculated should be borne by any specific product.

Prime cost of flat cost.—The direct cost of the product in wages and materials.

Stock.—As distinguished from material, those commodities which, having been manufactured, constitute the articles of trade.

Stores, rough and finished.—Rough stores include everything bought from outside, and may include finished articles, such as screws and bolts, bright shafting, finished special parts, and so on. Finished stores consist of parts of products often made in quantities in the shops, ready for issue to the erecting shop; as distinguished from stock, they are not manufactured for sale in their present state.

Lake Superior Iron Mines.

DULUTH, MINN., April 28.—Chief Engineer Robert Angst, of the Duluth & Iron Range road, has issued his annual statement concerning the status of the ore docks of the Lake Superior region. The season of 1902 opens with increased facilities to the extent of 56,920 gross tons storage capacity. The improvements at the head of the lakes include the No. 2 ore dock of the Great Northern at Superior, and No. 4 dock of the Duluth & Iron Range at Two Harbors. The capacity of No. 2 dock at Superior will be 87,500 tons this season, as compared with 62,500 tons last year. This is the largest ore dock in the world. Heretofore No. 2 dock of the Duluth, Missabe & Northern at Duluth, with capacity of 69,120 tons, has been the largest. The No. 4 dock at Two Harbors has had its capacity increased from 30,240 tons to 36,960 tons. The C. M. & St. Paul dock No. 1 at Escanaba has been increased 100 per cent, giving present storage capacity of 50,400 tons. The total storage capacity of the ore shipping docks of the great lakes is now 852,266 gross tons as compared with 795,346 in 1901.

Chicago interests were represented in a recent inspection of the Hawkins-Kinney properties on the Eastern Minnesota road, and it is believed these mines are already in Chicago hands. Several mines are to be opened up soon, all shipping to the Superior docks. E. J. Longyear, of Hibbing, is platting a new town on the northeast ¼ of the northwest ¼ of 32, 57, 22, near the Hawkins-Kinney lands.

Matt P. Mahlum has established a machine shop at La Crosse, Wis., and is manufacturing well-drilling machinery.

The Ohio-McCloskey Wire Fence & Construction Co., recently organized at Toledo, O., will be incorporated in Phœnix, Ariz., for $100,000. The incorporators are: George U. Roulet, John Stollberg, H. H. Hunter, Richard Kind, J. P. Degnan and James P. Daley.

John Finn, of Buffalo, N. Y., will locate a machine shop in Altoona, Pa., and has signed a lease for the Ramsey building on Green avenue.

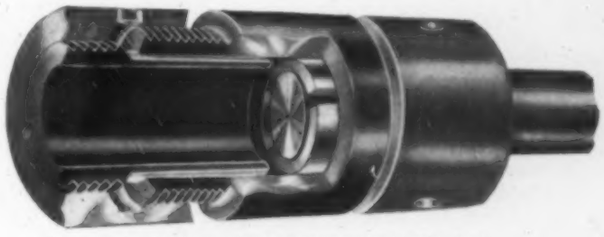
Articles of incorporation have been filed by the Tway Steel Forge & Machine Co., capital $100,000. The incorporators are Arthur Bunce, Jerome J. Wood and Edward L. Dodine. The company has purchased several acres of land in Camden, N. J., and will erect a large building.

The rolling mill of the C. Pardee Works at Perth Amboy, N. J., has been closed temporarily on account of the scarcity of billets.

VANDEGRIFT COMPRESSION SHAFT COUPLING.

Whoever has had anything to do with the shafting problem has recognized the need of improvement in sundry details of the ordinary methods of power transmission in shop use. It may be that when the question arrives at the stage where it is resolved into its elementary features, the evils will correct themselves and the improvement attained by electric or some similar method of transmission will render obsolete a number of the more recent inventions looking toward shafting convenience. The overhead work in the machine shop will, however, undergo many changes before it is likely to be improved out of existence if one may judge by the general development so far; and the trend of improvement in detail will bring to the front in due course similar contrivances to the one here described. This invention is the Vandergrift compression shaft coupling, as shown in the illustration. The half-tone gives the general construction, one half section being cut away to disclose the peculiar arrangement for gripping the shafts. It will be seen at once that there are no keys or keyways, neither bolts, screws nor flanges, nor any projection to endanger the unwary workmen. The coupling in position has a clean, smooth surface and the man who has seen or heard of setscrew accidents will note with satisfaction that the device is to all intents and purposes compact and harmless.

This is, however, a small portion of what should go to make up a really serviceable coupling, and the present device has other features of importance. The coupling consists of but nve parts, namely: one sleeve, two bushings and two nuts.



VANDEGRIFT COMPRESSION SHAFT COUPLING.

The sleeve is tapered on the inside from the center out to each end and is provided on the outside ends with right-hand threads. The two bushings are bored to the size of the shaft and slotted the entire length, allowing compression; these bushings are tapered to conform to the sleeve and are provided at the large ends with left hand threads. The threads cut on sleeve and bushings are of fine pitch. The nuts are threaded to fit the sleeve and bushings. The method of connection will tend to bring the coupled shafts into accurate alignment when the parts are brought into a close union, as will be noted by a close examination of the illustration.

The arrangement of the sleeves and nuts must not be confounded with the ordinary nut and bolt. The rotation of the latter in one direction just as surely tightens the connection as the movement in the other direction will operate to loosen the parts. The Vandegrift coupling is arranged to wind up either way the shaft may be turned or the load applied. In the one instance the coupling will tighten up and the heavier the load the tighter the grip. When the direction of rotation is opposed to this condition, the coupling is provided with a means of interlocking the bushings and nuts to produce the same effect, so that the tightening action is obtainable no matter how the power may be applied to the shaft. Complete instructions accompany each coupling.

The slots in the bushings permit of adjustment to a somewhat larger or smaller size than the standard dimensions by which they are designated in the list and a series of reduction couplings are made on similar lines, the general dimensions being estimated according to the size of the larger shaft. The sizes are manufactured for the range of merchant shafting from 15-16-inch to 5 15-16 inches and for purposes of comparison the diameter and length of the former are given as 2 and 4 inches respectively, while the same dimensions of the larger coupling are given as 11 and 22½ inches.

The Vandegrift compression shaft coupling is manufactured by the Vandegrift Coupling Co., of Indianapolis, Ind.

Evolution of the American Machinery Trade.—I.

The Niles Tool Works Co. and the Niles-Bement-Pond Co.

The marvelous advance made by the machine tool industry of the United States, that is referred to with such enthusiasm in the reviews of American progress, is a matter of the past two decades. The latter-day development of our material resources dates back to the close of the civil war, but it was not until the early eighties that what we vaguely style "modern" methods of machinery manufacture began to find acceptance. It was then that it became plain that the days of shops for general machine work that manufactured anything from a tap to a steam engine were numbered. The shop manufacturing but one line of tools or several kindred lines began to come more prominently to the front. As the number of machines produced grew with the rapid expansion of our manufacturing industries, there came an increased use of special tools, which could not be economically employed in a small business or where a large variety of work was turned out. Specialization became more and more the order and it is increasingly prominent as a feature of our machine tool development today.

The present article is the first of a series that will present some phases of this evolution of our machinery trade as illustrated in the history and methods of leading manufacturing and selling firms. The story of the Niles Tool Works Co. is one of small beginnings, and of the ambitious spirit of the West making its way against traditions. In this case the course of empire was eastward, as the narrative will show.

From Cincinnati to Hamilton.

To go back to first things, the Niles Tool Works perpetuates the name of John S. Niles who operated a machine shop in Cincinnati some 60 years ago. Mill work, steamboat and stationary engines and sugar machinery were the products of his shop. In the late sixties a tool-building department was organized. It grew into a business under the name of the Niles Tool Works, and the two energetic machinists in charge, Alexander Gordon and G. A. Gray, interested James W. Gaff, a well-known Cincinnati merchant, in their project. The firm of Gaff, Gray & Gordon was formed, and for four years carried on the manufacture of machine tools in a shop which in 1871 made way for the Pennsylvania Railroad depot at Cincinnati.

It was before the craze for bonuses from citizens' committees had become an evil, but there was yet a mild rivalry between towns for the location of industries, and Hamilton, O., made an offer that while modest enough in comparison with today's standard, was sufficient to secure the concern that has made her prosperous. For 15 acres of land the move was made to Hamilton, 25 miles away, and in 1872 the firm took possession of a modern shop with capacity for $300,000 worth of output a year. Only a year after the new shops were occupied the panic of 1873 broke upon the country, and in the few years of depression that followed the Hamilton enterprise had the experience of every industrial concern. Mr. Gray, who was then superintendent, retired in 1877, and in the same year R. C. McKinney, a Cornell University man, who had been connected with the Cope & Maxwell Pump Works, came into the company, first as secretary; later he was treasurer and general manager, until his removal to New York as president of the Niles-Bement-Pond Co. Mr. Gordon was the head of the company in 1877, and his already wide acquaintance was of incalculable value in the introduction of the company's tools. The railroad expansion of the late seventies brought prosperity to the business, which then as later had much to do with railroad shop equipment. Additions to the Hamilton plant came along with a regularity that indicated able handling of the sales department, and today practically every foot of the 15-acre site available for manufacturing is under roof.

It is not in the province of this article to go into questions of shop development and practice, but one concrete statement will stand for the whole. The Hamilton works are equipped with 30 overhead traveling cranes, of from 5 to 30 tons capacity. The variety and exceptional capacity of its tool equipment have made it a Mecca of machinery manufacturers. Its one handicap has been that it has rarely been free from growing pains. Its managers have built new plants with one hand while with the other they built tools to meet the insistent demands of their trade.

Changes in Personnel—Development of Sales.

With this rapid growth came the introduction of some new factors in the personnel of the company. Geo. T. Reiss, more recently secretary and superintendent of the Hamilton company, was a machinist in the late seventies. He was put in charge of engineering and has had an active part in the development of new tools and the improvement of old ones. James K. Cullen became identified with it in the seventies also. Later he was made superintendent; then for some years he had charge of the Chicago office. Today he is president of the Niles Tool Works Co. and manager at Hamilton. The company has been particularly fortunate not only in its executives, but in its sales representatives. There has been the regular introduction of new blood, but at the same time a permanence in policy and in the restless spirit of improvement that has characterized the administrations of President Gordon and of Col. McKinney. In the organization of its sales department it has gone on the principle that familiarity with tool building and tool operation through experience in the shop is essential to the best success in selling. While the merchant instinct of a good salesman has been given due prominence the aim has been to find this in combination with mechanical ability that recognizes more than broadly the adaptations of each tool to its work and that often assists the buyer to the best choice of tools to meet his needs.

Prominent in the selling organization of the company in the early eighties was Walter L. Clark, now vice-president of the Niles-Bement-Pond Co., who opened the New York office of the Niles Tool Works Co. 1886. Associated with him was E. McC. Davis, now secretary of the Niles-Bement-Pond Co. Both are practical and skilled mechanics. The establishment of the New York office 16 years ago was in the face of predictions of failure. Philadelphia was then the center of the machinery trade on its commercial side. Four years previous, recognizing this primacy, the Niles Tool Works Co. had started a branch house in Philadelphia. This was the first serious intimation to established Eastern concerns that the lusty competitor that had been claiming its share of the heavy tool trade in the West was to dispute their supremacy in Eastern strongholds. One year after the planting of the Philadelphia house, or in 1883, the Chicago agency was started. Geo. F. Mills is now the able manager of that branch. When the New York sign went up in the machinery row of lower Manhattan it was predicted that it would come down within a year. Sixteen years have passed and the single office of 1886 has expanded into the building at 136-138 Liberty street. Subsequently branches were established in Boston, Pittsburg, St. Louis, and London, Eng.

The Company's Methods and Spirit.

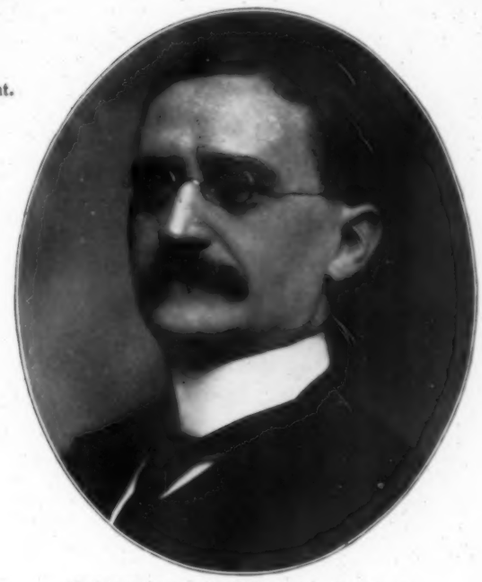
The purpose of this series of articles being to convey some adequate notion of the spirit that has inspired the steady advance of American tool manufacturers to their present place of eminence, I sought some information on this point in a recent conversation with a gentleman who has had opportunity to observe the methods of the Niles Tool Works Co. and to note the development of its policy in the past 15 or 20 years. Referring to the early operations of the Niles Tool Works he said that lathes and planers were built in a small way and the territory in which they were sold was comparatively limited. Worcester and Philadelphia were the centers of influence in heavy tools. Western tools were not considered seriously competitive; it was often thought sufficient argument against them, when they were first offered as substitutes for well-known makes, to say that they were Western tools.

"One of the chief characteristics of the Niles Tool Works Co.," said my informant, "has been its disregard of traditions and its readiness to work out new solutions of old problems. It is worth noting that the Hamilton works brought out the first double axle lathe. Eastern tool builders did not take kindly to the suggestion of a machine that would turn both ends of an axle at the same time. The Niles machine, turning

WALTER L. CLARK, Vice President.

THOMAS T. GAFF, Vice President.

A. C. STEBBINS, Vice President.



ROBERT C. McKINNEY, President.

E. McC. DAVIS, Secretary.

JAMES K. CULLEN, Vice President.

GEO. T. REISS, Chief Engineer.

OFFICERS OF THE NILES-BEMENT-POND CO.

two journals instead of one was gradually brought to such efficiency that 15 to 18 axles were turned in a day instead of 4 or 5 as formerly; today a record of 18 to 20 a day is made on the double axle lathe, the operator having a convenient crane which enables him to handle the axle alone. The special lathe for turning steel tired wheels for railroads was first brought out by the Niles works, and at the same time special machinery for the manufacture of such wheels was designed and built at the Niles works.

"Another instance of innovation is the planer brought out at Hamilton about 18 years ago for producing the split switch then made in a slow, laborious way, the rail being cut down from full width to a point. The ordinary planer, being made for cast iron, was not up to the work. The Niles company designed a machine especially for this service. It had low housings and a fixed cross-rail and there was only 12 inches space between the cross-rail and table. The result was great solidity and rigidity, and with this construction and the heavy steel gearing cut from the solid, it was possible to plough along the steel rail with two cuts 1½ inches wide by ⅛-inch deep. Formerly it took a man a day to cut down the rails for a single switch.

"About the same time there was brought out the Niles special pulley turning lathe. Up to that time the boring and turning of pulleys had been done on an ordinary engine lathe. The special machine makes possible the boring and finishing of 18 to 20 pulleys of 30 inches diameter and 8 inches face in ten hours. A recent record is the boring and turning of 12 pulleys 24 inches diameter and 5½ inches face and 6 pulleys 30 inches diameter and 6 inches face in 6½ hours.

The Niles Tool Works were pioneers in the manufacture of boring and turning mills. The drawbacks of the then prevailing methods of doing all work against a vertical face plate are well understood by every shop man. The task of adjusting the work was tedious and often very difficult. Its weight was always against you and just as the adjustment seemed complete the slightest deviation made it all to be done over. On the table of the boring mill, adjustment is speedy and easy, the weight of the work assisting rather than hindering. It offers special facilities for the chucking of heavy work. These mills have been changed constantly and improved since they were first brought out. At the first a 10-foot mill, weighing 10 to 12 tons, was the largest made. Now they run up to 30 feet. Then one 10-foot boring mill a month was considered a record; now one a day is nearer the average."

I asked what might be considered the most important line of recent development in the machine tool trade.

"Unquestionably electricity has been the most important factor in the business in the past few years. The introduction of the electric motor has brought no end of changes and the reconstruction is only fairly under way. The machine tool builder is asked to furnish motor-driven machines adapted to this, that and the other electrical system. The tool-buyer has a preference for a certain motor—and there is a multitude of them, no two alike, and the problem of the manufacturer of machine tools is to adjust his machine to the electrical equipment. The cost of these changes is something the average buyer fails to appreciate."

The conversation turning on the tendency toward special machines and the difficulty of conveying an adequate idea of their cost to buyers, who are often prone to value machinery by the tonnage of castings represented, this instance was cited:

"Not long ago the concern with which I am connected was called on to design and build a set of machines for a line of manufacture apart from metal working. The estimated expense of getting ready to make the first machine was an item that seemed out of reason to the buyer; and yet the actual cost far outran the estimate, the designs, jigs and templates alone amounting to thousands of dollars. That is the only use to which those jigs and templates will ever be put, for even now the machine has been discarded for something better. The cost of the brains and skill that enter into the manufacture of special machines seems to be entirely ignored by some buyers. You might almost as well compare the cost of watch springs with wire nails, as to attempt to gauge the cost of certain intricate machinery by the selling price of staple tools."

Expansion by Consolidation.

Something has been indicated earlier in this article of the steady growth of the Hamilton concern and its evolution from a so-called Western institution into a National factor in the heavy machine tool trade. This growth has been most pronounced in the past 20 years; from having 300 men in the early eighties, the Hamilton works now employ 1,800. But there were influences at work apart from this expansion from within that were destined to widen very materially the scope of the organization.

The first step toward the greater expansion was taken early in 1898, when the interests controlling the Niles Tool Works Co. purchased a majority of the stock of the Pond Machine Tool Co., of Plainfield, New Jersey, taking over the organization of that company in June of that year. Additional stock was secured from time to time until prior to the organization of the Niles-Bement-Pond Co., the controlling interests of the Niles Tool Works Co. owned practically 90 per cent of the stock of the Pond Machine Tool Co. The Pond works were originally located at Worcester, Mass., under the proprietorship of Lucius Pond. He was followed by David W. Pond, and later A. C. Stebbins became interested in the concern. The company removed about ten years ago to Plainfield, N. J., where extensive and very complete works were erected under the superintendence of Mr. Stebbins, who is now a vice president of the Niles-Bement-Pond Co. and general manager of the Pond works.

The succeeding year, the same interests negotiated and secured the plant of Bement, Miles & Co., of Philadelphia, pioneers in the heavy tool business and a concern of great reputation. This business was originated by William P. Bement in the fifties and grew to be one of the most important factors in the machine tool business of the country. The partners in Bement, Miles & Co. retained an interest in the new organization, Clarence S. Bement and Frederick B. Miles going upon the board of directors of the Niles-Bement-Pond Co.

For a number of years the majority holders in the Niles Tool Works Co. had owned a controlling interest in the Philadelphia Engineering Works, of Philadelphia, which during that time were builders of blast furnaces and steel plants. This concern was also taken into the general company, the plant rebuilt and largely extended and equipped with special modern machinery for the manufacture of the Niles electric overhead traveling crane. To this work the shops are now exclusively devoted.

Holding these concerns in this position, in August, 1899, the Niles-Bement-Pond Co. was organized. The capitalization of the company is $8,000,000, divided into $3,000,000 of 6 per cent cumulative preferred stock and $5,000,000 of common stock. The company was organized on a very close conservative basis. There were no promoters, no underwriting, no prospectus, and no bonds; and the stock was all subscribed by the interests directly concerned. The organization was completed by the election of Alexander Gordon as chairman of the board of directors; Robert C. McKinney, president; James K. Cullen, Thomas T. Gaff, A. C. Stebbins and Walter L. Clark, vice presidents; Charles L. Cornell, treasurer; and E. McC. Davis, secretary.

In the latter part of 1900 negotiations were under way for the control of the Pratt & Whitney Co., of Hartford, Conn., which were consummated in January, 1901. For many years this company and the firm of Pratt & Whitney, which preceded it, dating back to 1860, stood in the fore front of manufacturers of small tools. Gun, sewing machine and watch making machinery were important specialties and the works gained enviable fame in the manufacture of standards of measurements. A general reorganization of the company has taken place and new methods and improved machinery have been introduced. The results of the first year under the new management have been exceedingly gratifying. Contracts have just been let for large additions to the plant.

The Niles-Bement-Pond Co. has maintained the policy of following legitimate and conservative lines which prevailed in its organization. As the largest and most important machine tool building interest in the world, it has been under scrutiny in the past two and a half years. Its affairs have been managed with evident recognition of the fact that any misuse of the advantages of its position would be a stimulus to new competition. The economies of administration possible in such an

organization have been taken advantage of, and the development of the respective properties has been carried on on broad lines, the commercial and engineering sides of the business being both conducted with marked ability.

The identity of the constituents of the Niles-Bement-Pond Co. has been preserved. Each of the original companies makes its full line of tools and selling operations are conducted in the company names under which these tools made their reputation. In addition to the large one in New York in the same building with the general offices, there are stores in Boston, Chicago and Buffalo and in London, England, and selling offices in Pittsburg, St. Louis and San Francisco, besides that at the Bement plant in Philadelphia. There are agencies in all the machinery buying countries of Europe. The foreign trade in heavy tools has naturally felt the reactionary conditions in industry abroad, but business with England in tools of this class has been affected least of all, being of good proportions today. Exports to Russia are cut down by the retaliatory tariff restrictions that followed the imposition of countervailing duties by our Treasury Department. Previous to this action Russian government requirements for railroad shops were of good volume, and a good business had been done in connection with iron and steel works development at Mariopol and elsewhere. Home orders have crowded upon all the works of the consolidated company in the past year, and the chief embarrassment now, as in the iron trade, is that even with their best performance the shops lag behind what the buyers have cut out for them.

PRODUCTION OF WIRE RODS AND NAILS IN 1901.

The production of iron and steel wire rods in the United States in 1901, as ascertained by the American Iron and Steel Association, amounted to 1,365,934 gross tons, against 846,291 tons in 1900, 1,036,398 tons in 1899, and 1,071,683 tons in 1898, showing an increase of 519,643 tons, or over 61 per cent, in 1901, as compared with 1900. Of the total production in 1901, 1,365,459 tons were steel and 475 tons were iron rods. The following table gives the production by States in the last three years:

States—Gross Tons.	1899.	1900.	1901.
Mass., Conn., Rhode Island, N. Y., and N. J.	139,945	134,532	176,101
Pennsylvania	319,058	240,533	366,037
Ky., Alabama, and Ohio	312,620	241,731	422,679
Indiana and Illinois	261,775	226,525	391,117
Total	1,036,398	846,291	1,365,934

Pennsylvania made the largest quantity of wire rods in 1901, with Illinois a close second, Ohio third, and Massachusetts fourth. Seven other States, Rhode Island, Connecticut, New York, New Jersey, Kentucky, Alabama, and Indiana, also rolled wire rods in 1901. With the exception of Rhode Island, which first rolled rods in 1901, all the States named also produced rods in 1900.

The production of steel wire nails in the United States in 1901 amounted to 9,803,822 kegs of 100 pounds, as compared with 7,233,979 kegs in 1900, an increase of 2,569,843 kegs, or over 35 per cent. In 1899 the production amounted to 7,618,130 kegs, in 1898 to 7,418,475 kegs, in 1897 to 8,997,245 kegs, in 1896 to 4,719,860 kegs, and in 1895 to 5,841,403 kegs. The wire nails produced in 1901 were manufactured by 61 works, as compared with 56 in 1900. The production in 1901 was greatly in excess of that of any other year, exceeding by 906,577 kegs that of 1897, the next year of largest production.

The following table gives the production of wire nails in 1900 and 1901 in kegs of 100 pounds:

States—Kegs of 100 Pounds.	1900.	1901.
Mass., Rhode Island, and Conn.	212,584	71,553
New York	63,466	136,118
Pennsylvania	2,158,399	3,118,508
Md., W. Va., Ky., Ala., and Ohio	2,516,391	3,633,894
Indiana and Illinois	2,195,672	2,716,748
Mich., Wisconsin, and California	87,467	127,001
Total	7,233,979	9,803,822

The Aurora Foundry Co., Aurora, Ill., has purchased the plant of the Flush Tank Co., of the same place and it will be used for the production of gray iron castings exclusively.

"SCRUTATOR'S" OBSERVATIONS.

Mr. Q., a proof of whose article in this issue the editor has sent me, does not seem to agree entirely with me on the agency question. Among other things he says: "The personal acquaintance of a resident agent * * * is not to be ignored." This is one of the very points that I had been trying to bring out in my various former diatribes. Is it not better for the manufacturer to be his own resident agent and have his own personal acquaintance? Most of the leading machinery manufacturers now have their own stores in all of the large cities, and some of the gossips do say that not a few of the agents who appear to be sellers only, are really the principal owners in the smaller concerns which they appear simply to represent. However, I may be all wrong.

I have just had an experience which leaves me a little bit mixed on the question, to say the least. I ran up against a new machine which was to be manufactured, part of which was so very small and delicate as to be practically watch work, and it was not considered good policy to attempt to make this part of the machine in a regular machine shop. I therefore went down into Maiden Lane to see what could be done about getting these smaller parts made by some one in the watch business. All the time I have been selling machinery the only thing to avoid is the selling to some one who could not pay. I had no idea when I started for Maiden Lane that I could not buy anything there I wanted, provided I had the "price in my jeans," so to speak, and was somewhat surprised when I got there to find that no one in the district would quote me any prices until they first knew who I was and if I did not prove to be what they called "in the trade," they would not sell me anything at any price.

This seems to me to be the agency idea gone mad. It may be all right, but it seems to me that it is all wrong. I should think that the only sensible way to sell goods is to have one price for one thing, a certain smaller price each by the dozen, another certain smaller price each for a gross, and so on, to any one who wants to buy. Possibly we may yet get to the Maiden Lane idea of selling machinery.

When a concern like the Pennsylvania Railroad takes what seems to me such a large step backward as to call its Broadway ticket office a "booking office," and to drive people off their ferry-boats by the left-hand passage, to have their left-hand doors the ones to open and everything generally left-handed instead of right-handed, it is hard to see what will probably be the next thing to happen.

It seems to me that a good many things are left-handed, or reversed in some way at the present time: The Honorable Walsingham Wishbone for instance, simply because he is the Honorable Wishbone, (which corresponds to being "in the trade") has railway passes, Pullman passes, telegraph passes, and express passes, while the Ordinary J. Smith, who cannot afford it half as well, is obliged to pay cash before delivery. Mr. Biffany can go down into Maiden Lane and buy one watch, but "Scrutator" cannot buy 500 little watch wheels at any price. I recently rode from New York to Washington in a sleeping car, and was the only one aboard who did not have a railway pass. The other fellows were "in the trade"—they were all politicians.

My Maiden Lane experience has left me in rather a dazed condition and possibly some one else may be able to figure the thing out to a conclusion better than I can at the present time.

SCRUTATOR.

Work has been commenced on the erection of the two blast furnaces at South Sharon, Pa., for the Sharon Steel Co. They will have a daily output of 350 tons and will be completed within a year.

The Anderson Tool Co., of Anderson, Ind., is removing to 24th and Jackson streets into its new brick building, 102x36 feet, with a wing 86x36 feet. The new plant will give greater and improved facilities.

Considerable progress is being made in the reconstruction of furnace No. 2 of the Birmingham, Ala., plant of the Sloss-Sheffield Iron & Steel Co. It is probable that the furnace will be blown in about June 1 with a daily capacity of 225 tons.

The National Cash Register Co., of Dayton, O., and Its Manufacturing and Cost-Keeping Methods.

The National Cash Register Co., the "N. C. R.," as it is best known to readers of the factory literature, or the "Cash," as it is frequently termed by the residents of Dayton, O., is engaged in the manufacture of cash registers. These and nothing more are the products to which several million dollars of capital are invested in a very extensive plant. Incidentally the firm does other things; does them as a method of manufacture; makes no pretensions that they are the ends primarily sought but simply means employed to attain certain results and these agencies are classed with other manufacturing conveniences, valuable for what they accomplish in the saving of time, labor and money.

The product of the factory is too well known to need description. The familiar machine is a tireless bookkeeper and cashier in compact mechanical form, recording sales, computing totals and placing the responsibility for errors upon the guilty. So intricate a machine (the different machines require from 500 to 2,000 parts respectively) with such complicated co-ordinate functions may be said to contain many of the human characteristics with none of the tendencies to mental and physical weakness common to humanity. The Messrs. Patterson have among the relics of their earlier business career a cash register of primitive form, but one found so useful in their enterprise that they resolved to undertake the manufacture of the device. The factory has grown from the 2 employes in 1882 to some 2,600 at the present time. The company grew from the single room of 17 years ago to its first factory, now the Administration Building, in 1888. The Machinery Hall was added in 1895 when there were 1,047 employes. This was enlarged and duplicated with the new Machinery Hall in 1899 when the employes numbered 2,050; and other buildings and extensions are now in progress. In addition to the number of employes connected with the Dayton plant there are some 500 persons in the numerous agencies over the world.

FIG. 1.—NATIONAL CASH REGISTER CO.'S PLANT AT DAYTON.

The buildings already in use or in process of erection are located in the suburbs of the city in extensive grounds, about 8½ acres. The Administration Building is of brick and wood construction and is used for office purposes principally. It has three stories and a basement, 60x350 feet. Drawings are now being made to add one more story to this building. To the south of it, joined by a wing, is Machinery Hall with five stories and a basement of brick and steel construction, 50x350 feet. Building No. 3 has also five stories, and a basement, of brick and steel construction, 60x360 feet. A contract has been awarded for building No. 4 of similar dimensions to No. 3. The new power building is of brick and steel construction, 137x158 feet. A woodworking building has been recently erected and is in process of equipment. This building is three stories high with a basement, of brick and wood construction. The freight elevator is 6x18 feet and a passenger elevator is also contained within the building. There is a system of tracks and cars in the basement to store and handle lumber. Building No. 7 is a warehouse of brick and wood construction, one story high with sawtooth roof, 120x520 feet. Building No. 8 is in course of construction and will be completed in 60 days. It will be utilized for foundry purposes and will be one story high, of brick and wood construction, 120x380 feet. The surroundings of these buildings have been arranged with careful attention, the attractive possibilities of the grounds which are laid out with plants arranged in accordance with the elementary principles enunciated by the president of the company, namely: Avoid straight lines, plant in masses, open lawns.

Starting Point of a Unique System.

It was not, however, so much to note the exterior adornment of the plant that the writer visited the works of the N. C. R. It was rather to have an answer to the inquiry why so much effort had been exerted for the benefit of the worker and to get if possible in close touch with the system and organization in vogue. The present system does not go back to the inception of the company, no further back indeed than 1894. It appears that at one time an unusually large number of machines were returned from abroad as imperfect, and the head of the organization set about instituting a condition which should render such misfortune unlikely, perhaps impossible, in the future. It seemed to him that a few men were carrying the entire factory on their shoulders and it was advisable that the burden should be borne by the many rather than the few. A greater division of responsibility, more effective organization and improved equipment were essential; but the primal need was active and intelligent sympathy between the employer and the employed. Frequent lectures and circulars describing the methods by which waste of time and material could be avoided to the common weal had a good effect as the individual traced a necessary connection between the progress of the firm and his own benefit, but another agency had an even greater potency.

The president says that a man cleaning castings in the foundry complained that he could not get anything better to

do and was advised to make some good suggestion, to do something to help out and his merit would be rewarded by promotion. The man replied, "If I should do that, the firm would never know of it; it would be smothered and I should get no credit for it." From this suggestion has been developed the system of rewards. Over $1,300 is distributed in prizes each year for improvements which are sent in as follows: In every department is an autographic register for recording suggestions or complaints. These machines are of the manifolding type, making two or three copies by means of carbon paper. One copy of the suggestion slip remains in the machine and the other is torn off and retained by the employe. The registers are regularly unlocked and examined daily by the secretary of the factory committee. The opinion is then taken of such person as may be best qualified to judge of the merit of that particular suggestion and later the matter is considered by the factory committee as a whole and either adopted or rejected. If the idea is adopted, notice is at once sent to the employe. Officers, heads of departments and their assistants are barred from the competition so that the opportunity is open to the rank and file for successful effort.

Features of N. C. R. Policy.

The progress of the company has been attributed to the following characteristics of the management policy: meetings of the employes, promotion from the ranks, individual responsibility, liberal salaries, quick decisions. These are undoubtedly valuable features and are in accord with the desires of intelligent employes generally but the first item, while not the most impressive to the casual view, is in reality the key to the situation at Dayton. Meetings, frequent and forceful; the attrition of ideas, discussion of suggestions, are carried to an extent beyond anything of a similar nature known by the writer to exist elsewhere. So far is the principle recognized and followed that the position of superintendent and other similar officers is filled by committees freely exchanging full information and comparison of ideas. The entire business is conducted by a series of committees under the direction of the president, vice president and general manager. The executive committee is composed of nine members with the general manager of the company as chairman and this committee has the direction of the general policy of the business and the conduct of its affairs. The manufacturing department is in charge of a factory committee consisting of five experts severally in control of special lines of the factory work. The duties of the factory committe are such as would ordinarily be handled by a superintendent and his assistants. The factory committee, however, emphasizes a condition, common throughout the plant but not nearly so frequently found in other shops. The general improvement of the business demands keen criticism as well as co-operative effort, and the average superintendent, supreme in his position as manager of the manufacturing department, is not likely to invite the first no matter how he may desire the latter assistance. The committees make their decisions independently with a direct view to the best advantage of the entire business. Their work, as well as that of the several departments, is kept in order and managed through a series of monitor boards which keep the important items before the eye of the worker. By means of a system of colors the condition of each matter of business is known at once and the need of haste or deliberation is definitely indicated. Semi-monthly meetings of all foremen of factory departments are held at which details of work are considered and suggestions made for the advancement of the general interests.

A Brief Word About Betterment Features.

The betterment features of the plant have been carefully described in many magazines. The restaurant for the women, rest room, factory physician, the various clubs, schools and other beneficial institutions, etc., have been spectacular and rare attachments to a machine building factory. To these may be added the daily meeting of the officers of the 65 departments at lunch in the Advance Club, a custom of decided value in the genial interchange of thought and all the other advantages of personal contact with kindred spirits in the one cause. The men work 9½ hours a day with 10 hours pay. Weekly baths are allowed on the company's time (20 minutes to each employe) in neat and comfortable bath rooms. The women employed in the factory work but 8 hours a day. It may be here mentioned that the betterment features of the plant require a sum equivalent to 2 per cent of the pay roll.

The color scheme already mentioned in connection with the monitor boards is followed out with many of the forms used in connection with the different machines. A separate color would not be convenient for many varieties of machines and broad bands of color arranged in different ways on the cards are equally striking and give the necessary means of identifying the particular department that the order blank may indicate. When a box of material is ready for transference to another department or another worker in the same department a colored card bearing in prominent letters the words

FIG. 2.—A VIEW OF THE BUILDINGS IN FIG. 1, AS SEEN ACROSS THE LAWN.

"MOVE IT" is attached and it receives speedy attention.

Extent of Manufacturing Operations.

The machine-making departments are scattered over several buildings and a free use of tunnels and elevators is employed to handle the product expeditiously, to limit the task of each worker to a single operation, and to pass the work down the line of workers in a regular and continuous movement from one end of each room to the other. The uncommon features in management are reflected in the peculiar methods employed in many instances for the production of some machine part. The press room, for example, has a remarkable collection of die work. Many of the small gears and levers are punched out and occasionally joined together by press work of a peculiar character. Some of the levers formerly cast are now punched out of ⅛-inch steel stock and as an instance of the amount of material consumed in the factory for this purpose, it may be mentioned that last year 1,000,000 pounds of punching steel were required. So far as quantity of material is concerned, during the same period 1,750,000 pounds of gray iron and 1,800,000 pounds of cold drawn steel were needed to fill the factory requisitions.

On one side of the press room was a set of machines engaged in a task calculated to give a manufacturer of screw machinery something to think over. Anyone acquainted with the manufacture of wood screws will see the comparison. The machine was engaged in the production of threads by a rolling process on machine screws at the rate of 200 6-32s per minute.

A pantagraph profiler of multiple type is illustrated in Fig. 5. The variation between the size of the pattern figures on the large disc on the bench and the small rims on the segments shown on the rods, to the right of the machine, will indicate the relative proportions of the pattern and the work. The profiler finishes the figures on the segments as rapidly as the attendant can follow round the curves of the pattern. The machine is extremely simple in design and has a solid appearance, far from being suggestive of the average pantagraph. The skeleton framework of the latter usually having a very fragile construction liable to fail at a critical moment and a machine of a rugged construction having a multiple action is something of a curiosity to the ordinary mechanic.

All the machine tools, presses, etc., are painted yellow, and this color is not objectionable on one ground at least. It is restful to this eye and this is an important consideration for hygienic reasons. The color is not so attractive as aluminum bronze, which has been introduced in some machine shops and it is a moot question whether the one color is more or less desirable than the other. The yellow does not wear any too well and in actual use requires renewal or some cleaning process at short intervals in order to maintain a neat appearance. All the shafting has independent electric motor drives from a 2,200 horsepower installation and this gives a flexibility to the individual units of transmission that must be extremely useful when it is necessary to have one branch of the plant at work for a longer period than another.

The Tool-Making Department.

Several views of the machine department are illustrated and the height of the rooms, the cleanliness of the floor and the excellent arrangements for lighting tell their own story. The tool-making department has a lathe which is something peculiar. It has been specially arranged for backing off formed cutters. Now, backing off formed cutters is not a novel process in the plant manufacturing machinist's tools but there are few plants where the magnitude of the work demands so many of these cutters that a couple of lathes would be required to produce them. The motion of the backing off tool is obtained from a plain double tooth cam driven by means of a pinion in mesh with a spur gear on the nose of the lathe spindle. The spur gear takes the place of the face plate. A block of rubber is employed as a buffer to bring back the cross feed slide against the cam, and the face of the latter is about an inch wide to insure a good wearing surface. The device is quite satisfactory and has a minimum number of parts.

A visit to the tool-making department is another pleasant feature of a machinist's experience at the plant. The parts of the cash registers are so numerous and the operations so varied that the production and inspection departments require many jigs, fixtures and gauges. Many of the jigs were made with apparently every attention paid by the designer to the production of a convenience involving but a limited amount of labor by the tool-maker; for example, spots for bearing points so that a considerable surface need not be machined. On some of

FIG. 3.—MILLING DEPARTMENT IN TOOL ROOM.

the jigs an entirely different procedure was followed; finish all over, with a liberal amount of frosting thrown in. If there is any place where frosting seems utterly out of place it is in a jig. There may be something in the influence of a finely finished jig to hold the attention of the user down to a careful handling of the work and a cautious method may be expected from the workman brought under the spell of frosted surfaces. The tool-maker in the ordinary shop is content with the finish put on the work that travels through the jig and has little time for refinements elsewhere. The mystery of the frosted and scraped surfaces did not come to light entirely and may be set down as an additional endeavor toward the ideal condition not thoroughly explained. The tool-making department employs 130 men.

Unique Features of the Power House.

This cash register style of doing things is carried out in other directions with equal fearlessness as may be seen in the view of the new power house shown in Fig. 6. The small double doors on the right lead into the boiler room and the doors to the left form the entrance to the engine room. It will be seen that the runways of the crane, inside the engine room, are extended beyond the walls and that the I-beams span the alley-way crossing the end of the building. And it will be equally evident that granted an opening in the end of the building the crane could be brought out over the space outside the power station for the purpose of unloading teams and transferring their contents to the interior of the plant. This is the situation; but that is not the whole story by any means. On closer examination of the half-tone it will be noticed that the entire glass front of the building is thoroughly stayed and braced, supported from the runways of the crane; and when it is necessary to bring the 40-ton crane outside the structure it is preceded on the 49-foot span by the whole end of the building and then the service is as clear and uninterrupted as if the lifting facilities were within the building. The same thing is carried out to some extent with the crane running on the single I-beams to the right of the illustration. This enters the boiler room and the weights contemplated are within the capacity of a smaller crane. The single I-beam supported on the one outer column is sufficient for the purpose and is a neat and unobtrusive arrangement for conveying loads into the plant.

Some day a new condition will try the resourcefulness of the engineers at the plant. The new buildings are already far apart, with somewhat insignificant structures between them. The latter will, with the desire for spacious lawns and park-like surroundings about the works, pass away and the underground system of communication will either be more in vogue than ever or a method of bridging the intervening space will come into use. The bridge alternative is not so likely to happen for various reasons; the main objection being the difficulty of designing such a system and preserve the pleasing appearance of the plant. Communication of a quick and comprehensive nature will be imperative for transportation of raw and finished material and we may then see the problem solved in as unexpected a cash register style as some other difficulties have been met and conquered. Perhaps a conveying system will be introduced similar to the arrangement for the continuous handling of coal or ore; but, whatever the solution, the situation is near at hand and will be recognized aright at the proper time.

The Duplication of Men for Responsible Place.

The cash register system has its chief peculiarity, in the opinion of the writer, in the training of subordinates. It would appear that every man or woman about the plant has an understudy, amply qualified to take up the reins of responsibility. The ordinary mortal does not take kindly to the training of a substitute, there are too many opportunities for the pupil to outstrip the master and oust him from his position. The practice is insisted upon here for the purpose of leaving the men at the head of affairs free to do original work, to avoid the taxing of their time with routine matters and provide them with leisure to plan and if need be to travel beyond the factory limits for information in their respective departments. It is not to be expected that men will take kindly to this procedure, which may filch from them the gains achieved by many years of labor; but the custom has its advantages to the establishment even if the worker may not relish the possibilities. It is only fair to say that the custom is so generally followed throughout the plant that no one need have any fear of discrimination, and in actual practice the method certainly works well. The writer called the attention of an officer of the company, a gentleman holding a position of large responsibility, to the system and suggested the dislike with which many men would contemplate the possibilities that might follow in its train. He assented to this and acknowledged that originally he had so thoroughly entertained that impression that he had held aloof from the appointment and training of an assistant as long as possible. He was courteously reminded of the need of a capable man to take up his duties in time of need, and he evaded the matter by pointing out various objections. Finally he was informed that an assistant must be

FIG. 4.—LATHE DEPARTMENT IN TOOL ROOM.

forthcoming or it might be troublesome to find a man to train him. A gentle hint that the principal was not incapable of substitution, anyway.

The frequent intercourse of the officers through the plant

FIG. 5.—MULTIPLE PANTAGRAPH OR PROFILER MILLING FIGURES IN METAL SEGMENTS.

and the free communion of thought has called forth another method which may be unimportant in appearance but is in reality highly commendable and convenient in a plant of this size. At the station of every officer, assistant or clerk, is a card, conspicuously placed, giving the name and rank of the employe. This permits a visitor to that department to identify any person as well as to cultivate a knowledge of the connection between faces and names that cannot fail to be of benefit from either a business or social standpoint.

The monitor board system is adopted to show the grades of the different departments. The proficiency of the factory departments has been based on health, punctuality, quality, quantity and cost. The departments having the highest record for the year are awarded a special prize, usually a day's outing with special entertainment and all expenses paid. One of the illustrations shows this monitor system in statement form and it will be explanatory of some changes finally adopted in the grading of the departments. It is not now so imperative that the positive virtues of punctuality, health, etc., be first and foremost in the rating, but that the minimum amount of negative qualities be shown. The fewest complaints registered against a department, a minimum quantity of spoiled work in proportion to the maximum output, fewest tardy workers, etc., are enumerated for the year with all the other departmental demerits. The system may be carried out to the individual stage, though that contingency has not yet arrived in the experience of the writer. Perhaps it would not be practicable to rate a workman altogether by the demerit system but some method of calculating his efficiency by the minimum amount of scrap compared to his total output seems a natural transition from the method of departmental rating at Dayton. How far this would be of value in the shop management is a moot point.

The large printing and binding plant maintained within the establishment affords considerable freedom in the preparation of forms and blanks of every conceivable style. The printed matter has been carefully arranged to facilitate entries of all kinds with the least amount of purely clerical labor and these are freely distributed for general use. Some of these have been selected for illustration as showing certain peculiarities, but no attempt has been made to give a comprehensive assortment of the collection. The good old maxim, "when found make a note of," is here developed elaborately and as an instance the writer quotes a prominently displayed card seen in the purchasing agent's office.

"TEN IMPORTANT POINTS IN MAKING OUT ORDERS OR CONTRACTS."

1. Subject Matter, Material, Labor, etc.
2. Quantity, Number or Weight.
3. Size.
4. Quality.
5. Conditions.
6. Prices, Terms of Payments.
7. Dates of Shipment.
8. Carriage.
9. Guarantee.
10. Approval.

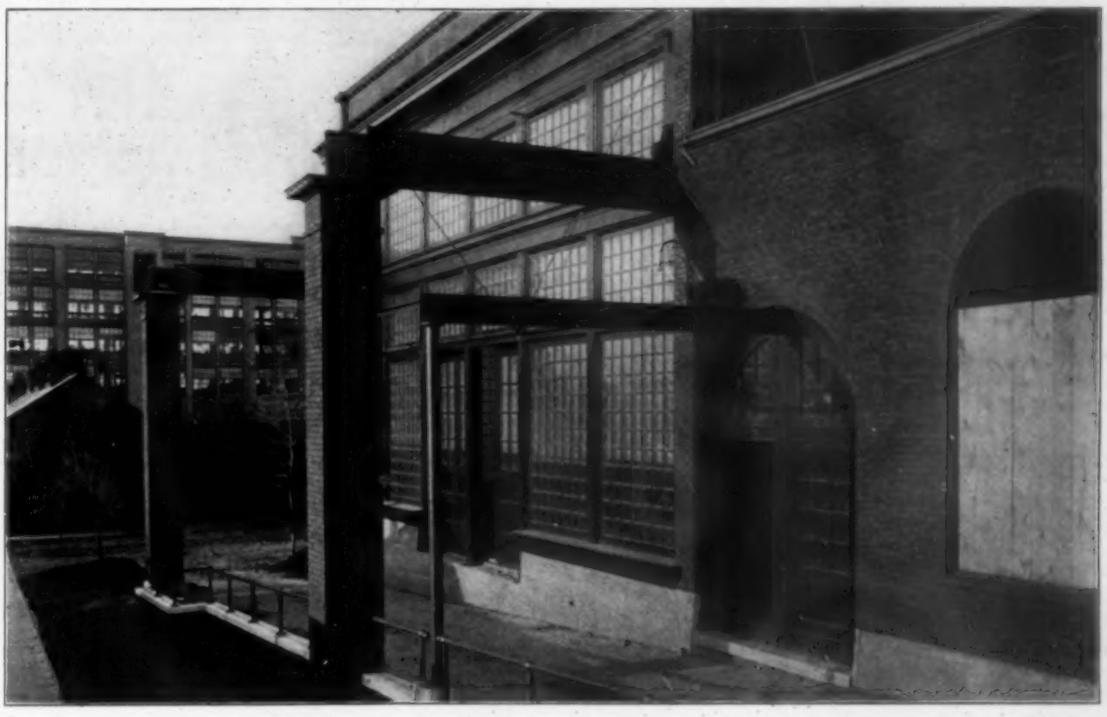


FIG. 6.—POWER HOUSE WITH MOVEABLE END AND CRANE-WAY EXTENSION.

This is but one of the many memory aids to be found scattered through the different departments from the Collection to the Patent Department.

The Cost Keeping System.

The peculiar requirements and conditions of the manufac-

ture of cash registers involve some features different from the ordinary cost keeping systems in other plants. It is generally conceded that no one arrangement is in practice applicable to all branches of trade but must be made adaptable to the special requirements of the business to which it is to be applied. This is essentially the case with the cost system in use by the National Cash Register Co. It has been made to comply with the special needs of the business, the manufacturing cost being the principal object in view. Following out this object to its legitimate conclusion, the system is chiefly confined to the factory departments, of which there are 45 in number, 26 of these being purely productive in character. The others are devoted wholly to the matter of general expense, such as supervising, experimenting, handling of stock, trucking, engineering, clerical, maintenance of plant and equipment, etc. Five of the 26 departments are classified as auxiliary productive departments, namely: the Brass Foundry, Paint and Varnish, Carpenter, Printing and Bindery.

The main object in so classifying them is to keep them entirely separate from the manufacturing of registers, calculating the respective products of each on a competitive basis, so that the result can be compared with the bids of competitors in the same line of business.

The labor is divided into two classes in order to simplify the cost keeping work as much as possible, the two classes being known as the direct, or non-diffused labor, and the indirect, or diffused labor. The direct labor of each department is the productive labor of that department and this class forms the basis on which the indirect labor and supplies of the department are diffused, after the direct labor has been properly distributed to the various accounts.

About 60 per cent of the productive labor is handled on a piecework basis and the result of this labor is compiled as follows: Each pieceworker is furnished with a ticket (3⅞x6¼ inches) for every job he performs. On this he records his name, check number, time occupied on the operations, with class of work and the number of pieces operated upon. This piecework ticket is made in duplicate with a line for each signature of the workman, foreman and inspector, through whose hands that particular job must pass. The boxes used in the different departments are made on a uniform plan, painted black with a conspicuous number in white, and bearing a letter designating the size. The piecework ticket when completed has the number of the box entered upon it and the several columns contain in addition to the matter already mentioned: the number of pieces finished, the number lost and number accepted, the price allowed the pieceworker, the time commenced and finished as well as the total time consumed in the work.

The work having been counted and thoroughly inspected, the tickets are recorded on a clearance sheet, Fig. 8, and are then turned over to the clerk of that department who distributes the results of the different tickets of the individual workman on his weekly piecework record, charging the various accounts accordingly. These weekly piecework records are elaborate affairs, 19x15¾ inches, punched and bound with linen for incorporation on the plan of a loose-leaf ledger. Separate columns are ruled off for the different types of cash registers, names of parts, dates, operations in each job, time, quantity and rate. The actual cost of the direct labor on production being brought out to mills. These records are handed in to the Piecework Accounts Department, where they are audited and a certified voucher for the individual pieceworker being sent to the paymaster. The Cost Department then receives the pieceworkers' records after they are audited and the totals are entered to the various accounts upon the distributing blanks.

The employes who are paid by the day are each provided with a daily or weekly time sheet, as may be required by the nature of the work performed, and upon this sheet is entered by the workman a correct and complete record of the class of work and the time which has been consumed in the operations required. This record is certified daily by the clerks of the respective departments and is finally handed to the Cost Department at the end of the week. The total time of each day-worker is also compared with the records of the paymaster so that all chance for discrepancy is eliminated.

The clerks in the Cost Department, after assorting the weekly time sheet of the day-workers, the assortment being made in accordance with the individual rates and by departments, immediately enter upon the distributing blanks the earnings against the various accounts; turning the time for each item into money by means of rate tables computed by the department. Thus the Cost Department compiles weekly a complete and correct account of the work performed by each

CLEAL	CARPENTER	REEVES	HOUK	DOHNER
Inventions No. 1. Foreman, Thos Carney Assistant, C Lundgren No. men, 7	**Labor.** Head, C U Carpenter	Assistant, A H Campbell No. men, 4	**Final Inspection.** Head, R T Houk No. men, 6	**Screw-making.** Head, J H Dohner Assistants, H Bergen C E Berry Job bosses, 3 No. men, 64
Inventions No. 2. Foreman, J P Cleal Assistant, J A Werner No. men, 11	**School for Foremen.** Head, C U Carpenter	**Outside.** Head, G B Hicks No. men, 45	**Adjusting & Testing.** Head, R T Houk Assistant, D D Hendrickson No. men, 27	**Drill.** Head, G W Jeans Assistants, L Blum W Bach No. men, 96
Inventions No. 3. Foreman, Thos Carroll Assistant, P Kell No. men, 11	**Inspection.** Foreman, N Clunet Assistants, M Pursell J Haver Job bosses, 7 No. men, 87	**Foundry.** Foreman, J McTaggart Assistant, Jno Logan No. men, 81	**Bindery.** Head, Miss E M Haas Assistant, Miss L Sheehan Job bosses, 3 No. employes, 59	**Bench.** Head, E Stuck Assistant, F W Adams Job bosses, 2 No. men, 81
35 Assembling Room. Foreman, P Souders Assistant, W Bell Tracer, 1 Job bosses, 17 No. men, 167	**Engineering.** Foreman, A Hoffmann Assistant, W A Blum Job bosses, 4 No. men, 46	**Paint & Varnishing.** Head, E Carter Assistant, C Aszling No. men, 33	**D. A., 33 & Auto. Assem.** Head, H M Swope Assistant, W Spangler Job boss, 1 No. men, 59	**Punch Press.** Head, W H Hoopert Assistant, Wm Wilson Job bosses, 2 No. men, 61
79 Assembling Room. Foreman, R Riddle Assistant, W Hartman Job bosses, 8 No. men, 165	**Stock and Cost.** Foreman, J J Schaeffer Assistants, J Finfrock W Brown J Smith J P Montgomery Job bosses, 7 No. men, 80	**Pattern.** Head, G H Mould Assistant, E Sonnenstein No. men, 13	**Brass Room.** Head, G W Grove Assistant, Chas Aiken Job boss, 1 No. men, 59	**Lock and Drill.** Head, C M Baker Assistant, Miss Boroff Job boss, 1 No. men, 91
135 Assembling Room. Head, C W Chambers Job bosses, 1 No. men, 24	**Piecework.** Head, R A Carney Assistant, C F Meyer No. men, 9	**Etching.** Head, J S Bradfield Assistant, B W Kerfoot No. men, 11	**Composing and Press.** Head, B H Noyes Assistants, T R Coles H E Bingham Job bosses, 5 No. men, 63	**Polishing.** Head, A C Horne Assistant, J Gaffney No. men, 92
Tool Room. Head, F P Sager Assistants, J C Martin R H Wildasin Job bosses, 1 No. men, 121	**Stock Receiving.** Head, A O Blum No. men, 5	**Window Display.** Head, W F Schweiger No. men, 5	**Shipping.** Head, O P Gothlin Assistant, A O Aulabaugh No. men, 8	
Tool Supply. Head, E C Rhonemus Assistant, D R Hall Job bosses, 1 No. men, 16		**Indicator.** Head, Miss M Haas Assistant, Miss Fickensher Heads of Jobs, 3 No. employes, 102	**Repair School.** Head, H Bayzarian Assistants, J J Johnston C Wirshing B Olinger No. men, 18	
Tool Designing. Head, W W Patterson No. men, 6		**Wood-working.** Head, G Argabright Assistants, F I Runyon A Gregg Job bosses, 2 No. men, 88		
Blacksmith. Head, G Gardner Assistant, W G Souders		**Indicator Dipping.** Head, C V Rhoden No. employes, 12		
		Janitors. S J Gorman Assistant, J H Skelley No. men, 28		

The above table represents the making divisions of the factory with the name of the man in charge at the head of each column. Mr. F. H. Bickford is general manager over these. The system of factory organization in a separate class, under a manager, heads of divisions, assistants, heads of departments, assistants and job bosses, with relative numbers of employes, is clearly shown in this arrangement.

FIG. 7.—SCHEME OF FACTORY ORGANIZATION.

employe of the factory by departments and from these data comparative statements may be made.

The Cost Department keeps a thorough record of all supplies drawn on each department by means of duplicate certified requisitions issued on the various stockkeepers and the

purchasing agent and the amount is thus easily charged. Special forms, differing in style of printing and color, are adopted for ordering material and these are restricted in use to certain uniform rules. The requisition upon the stock department is handled as follows: "All requisitions must be made upon the one form only, clear and distinct, otherwise they will not be accepted. Requisitions must be signed by the head of a department or his authorized representative. When the head of a department gives authority to some one in his department to sign his name to requisitions, a memorandum of such authority together with the signature of the authorized representative must be sent to the stock department. This is imperative. In ordering raw material, order but one class of goods on a requisition, and always give the use for which the material is intended. Sheet brass should be ordered by gauge, steel by decimals, and Stubb's and Crescent special drill rod by their respective gauges."

The Cost Department is thus furnished with an authentic account of the expense of each department and can make monthly reports of the direct cost of production.

Every month, after the records have been so obtained, the productive or direct labor of each department forming the basis, the indirect or nonproductive labor and the supplies drawn by the department are pro-rated upon the direct labor of the various accounts, thus forming a basis by which to diffuse the general expense; the latter comprising the labor performed and the supplies drawn by the general expense departments. The direct material for all productive accounts, being reported on foremen's copies of the orders issued by the Stock Department and charged directly is then added, forming complete charges to the various productive accounts. This information enables a report to be prepared and transmitted to the treasurer monthly showing a complete record of the material drawn and labor performed in the factory. This report covers the amount expended for labor and material, divided into direct, departmental and general, as well as the product of these three elements, as applied to: first, factory accounts, registers and supplies, register repairs; second, factory costs for selling expenses. These comprise advance and commercial accounts, the former including the different betterment projects of a literary and social order and the latter including advertising and supplies, agents' repairmen and outfits, office supplies and stationery, foreign and personal items, agents' supplies and stationery. The third general division covers the factory costs for fixed investments, as machinery construction, factory tools construction, furniture and fixtures, pattern making and plant construction. The totals of each of these under the several divisions are given separately, and the paymaster's report is also entered for each week. These are summarized as the total factory rolls, the amount added from the office and the outside force. The sum total agrees with the total labor to balance the report.

When the cost of any special job is sought, a cost order is issued through the Cost Department where the symbol and the consecutive number are first stamped before the order is sent to the department performing the first operation on the work. Each department reports to the cost clerk the amount of time occupied and the material utilized in performing its share of the work, and this course is followed until the job is concluded.

When the original order returns to the Cost Department the cost clerk calculates the cost of production from the information reported by the various departments through which the job has passed, pro-rating the departmental and general costs upon the same basis established in making the monthly reports.

The cost of register parts is obtained from the clearance sheet, Fig. 8, and the stock records in the manner previously described. The charges obtained against the various classes of registers are divided by the respective product monthly, thus obtaining a periodical cost per register of each class, from which comparative statements can be compiled.

The Piecework System.

The piecework system may be here described with further detail than was advisable in connection with the work of the Cost Department. Let us suppose that the supply of pieces or parts of any one detail of a standard machine has decreased to an extent calling for another lot. The number on hand in the Stock Supply Department is very nicely regulated by a very convenient adjustment of the quantity as being "high" or "low." The two terms are of course relative to the particular piece; one part of a machine would be "high" at 50 and "low" at 20, while another might be "high" at 200 and "low" at 100. In either case, when the stock falls below the normal number, an order is placed for a proportionate supply. Should the supply on hand have reached a lower level than the minimum allowed then a rush order is sent after the regular order that may be then on the way through the plant and this particular order is then given precedence over other work for which there may be no more than an ordinary demand.

The Stock Supply Department has placed an order for a certain number of pieces. The order is made out in duplicate, the Stock Supply Department retaining one, while the other is sent to the foreman of the department that begins the work.

When the foreman is ready for the work he sends his order to the StockSupply Department. The pieces or parts are then placed in a box, together with a "stock card," Fig. 9, giving the name of the stock, the number of pieces, and the number of operations that are to be performed on each piece. This stock card, Fig. 9, may be for so common a piece that it will be found convenient to have the leading data printed on it. This is the case with the No. 2 side frames as illustrated. The number of operations are given in printed form and it will be seen that a number precedes each of the terms, as "37 Profiled," "39 Reamed," etc. The numbers are sufficient to identify the operations, though in many of the cases a rubber stamp is em-

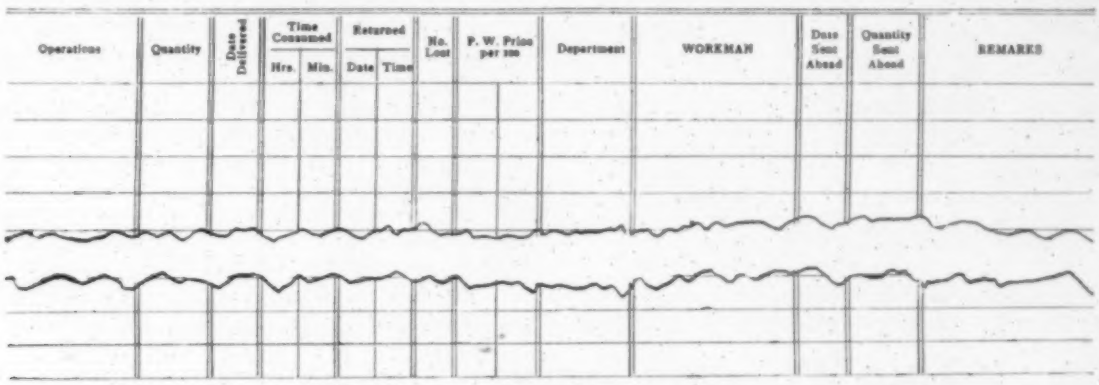


FIG. 8.—CLEARANCE SHEET, 8½ X 11 INCHES.

ployed for this purpose and the number and the name of the operation are as easily placed on the order together as separately; in other cases the number alone is more readily written and a short line of a few figures may thus concisely hold several operations. In addition to the numbers given on the stock card shown in Fig. 9, 36 is the equivalent for "punched," 48 "splined," 58 "turned," 78 "soldered," 88 "carbonized," 84 "pinned." The box containing the stock is then sent to the foreman, who gives it out to a workman; he in turn does the work and makes out a ticket in duplicate form, copying from the stock card the name of piece, number of pieces received, and the operations he has performed. This is his regular piecework ticket. He also enters upon the ticket his check number, the time and date he commenced the work, the time and date finished, and the number of hours it took to complete the work, after which he signs the ticket and hands it to the foreman.

N. C. R. CO.
Order for No. 79 Stock.

Box No. _____ 190__
Name Side Frames, No. 2.
No. Ordered _____ Per Box 12 Lot No. _____

OPERATIONS	No. Pieces Delivered	Time Delivered		Due Date			Inspected	No. Lost	Total Ahead
		Day	Hr.	Mo.	Day	Hr.			
37 Profiled									
39 Reamed									
11 Drilled									
11 Drilled									
55 Tapped									
55 Tapped									
30 Milled									
30 Milled									
67 Strapped									
30 Milled									
30 Milled									
30 Milled									
11 Drilled									

Final Due Date _____ 190__
Pieces Received In _____ Stock Room.
No. _____ Stock Keeper.

FIG. 9.—STOCK CARD. 4¼ X 7¼ INCHES.

ently correct, is signed and transmitted by him, together with the work and the stock card to the inspector. The inspector then inspects the work, and enters the "number accepted," in the proper column of the piecework ticket. He signs both the original and duplicate tickets, and sends them to the "clearance house," where they are separated and the date and hour of inspection are stamped on the back of each. They are then transmitted, the original ticket to the Piecework Department, and the duplicate to the clerk of the department in which the operation was performed. The work is then sent to the department in which the next operation is to be performed. This routine is repeated until all the operations are completed. The inspectors are allowed until Tuesday noon to inspect the previous week's work. The Piecework Department obtains all the original piecework tickets that have not previously reached it, while the clerks in the departments in which the several operations were performed, receive the remainder of the duplicate tickets.

Since the Piecework Department obtains possession of the original tickets, and the department clerk of the duplicate, as soon as the inspection is completed, it will be seen that only a small number of tickets are received as late as Tuesday noon.

Upon receipt of the duplicate tickets, the department clerk prices the work, making the extension, and enters it to the workman's credit on a sheet specially prepared for that purpose, with vertical rulings for the different register classes. If the work is for the No. 35 register, it is charged to that column; if it is No. 79 work it is charged to that column—and so on for the different classes. After entering all the duplicates received until noon of Tuesday, the department clerk proceeds to close his accounts, which should be done by the time the shop closes Tuesday evening. The accounts are then transmitted to the Piecework Department. In the meantime the Piecework Department has priced and extended the original tickets. It has carefully examined them to see that they are properly filled out, that they are signed by the workman, foreman, and inspector, and that the name of piece, operation and job number correspond, and that there is no discrepancy as to date and time, and that they are regular in every way.

The sheets that have been written up by the department clerks are then audited from the original tickets. In case any errors are found the sheets are corrected, and a voucher in duplicate form is written for the amount of each workman's earnings. The original voucher goes to the paymaster, and the duplicate to the department clerk. The department clerk then hands the duplicate voucher, together with the duplicate tickets, to the workman, who is thus enabled to verify the correctness of the amount for which the voucher is written.

The above covers the work done in the Piecework Department up to the time the workman gets his voucher for the previous week's work, which is not later than 5:30 P. M.

TIME WORKER'S WEEKLY LABOR REPORT.

WORKMAN _____ No. _____

WEEK ENDING _____ 190__

DEPARTMENT _____ Rate per Hour _____

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	DESCRIPTION OF WORK	TIME IN DETAIL Hrs.	TIME IN DETAIL Min.	DAILY TOTALS Hrs.	DAILY TOTALS Min.	DAILY O. K.

FIG. 10.—TIME WORKER'S WEEKLY LABOR REPORT. 7½ X 11¼ INCHES.

Wednesday. (The paymaster pays off the help on Friday).

The Piecework Department also makes monthly reports to the Factory Committee, showing the average earnings per hour on piecework, the amount of the pay roll for the several departments, and the percent of the piecework pay-roll to the total direct labor roll. The department also keeps on file in the office a complete record of every workman, showing his average earnings per hour on piecework for each month, so that a comparison may be made at the end of the year.

The Piecework Department prepares a monthly statement for each department showing the piecework hours, piecework earnings, day-work hours, day-work earnings, total working hours, total earnings, the earnings per hour, the piecework, day rate and the gain percent of piecework over day work for each pieceworker in every department. These reports are kept on file so that the foreman may readily ascertain at any time what each workman in his department is averaging per hour. In all departments, wherever it is practicable, a record is kept of each job, showing the names of the different workmen who work on that job, the number of pieces turned out by each, the time required, the total cost and the average cost per hour. This enables the Piecework Department at any time to give all particulars regarding any piece of work and this is frequently found very useful in the adjustment of piecework rates.

and before the bills are O. K.'d and paid. All stock received is immediately turned over to the raw stock inspection room, and, after inspection, is then sent to stock with a ticket marked "1," which must accompany all stock sent to the raw stock room. Should any of the stock be rejected, this fact is reported on a blank form, which serves to provide against shortage owing to extra heavy rejections, and the stock rejected can then be immediately ordered replaced.

In this raw stock inspection room there is inspected all material of whatever nature; such as punching steel, of which there was gauged, in round numbers, 1,200,000 pounds during last year; cold drawn steel, of which there was inspected 725,000 pounds during last year; marble slabs, about 25,000 per year; glass, about 60,000 pieces during the year; about 65,000 drills, 2,400,000 springs of all kinds, 65,000 locks, 15,000 clocks, brass tubing, files, screws, buffing wheels, emery wheels, copper (90,000 pounds per month), sheet bronze, sheet brass, all of which received a careful inspection upon receipt, many of the parts being micrometered and held within .00025 inches. Of grey iron castings there were handled and inspected about 1,450,000 pounds last year and also 800,000 pounds of paper, all of which is carefully inspected.

Stock Moving and Inspection of Machine Posts.

Stock is ordered into the factory by the Stock Department on orders, a duplicate being sent to the clearance house, together

Book_____ Lot No._____

Date_____ 190__

Name of Part_____

Kind of Material_____ Price_____ Weight per 100_____

Operation	Dept.	Dept. $	Flat Cost per 100		Dep't'l Diffuse			Good Bronze		Scrap Bronze			
							Total departmental flat cost of labor,						
							Add cost of material,						
							Flat cost,						
							Add total departmental diffused cost,						
							Add general diffused labor and supplies,						
							Complete factory cost,						
							Signed_____						
							Clerk_____						

FIG. 11.—COMPLETE FACTORY COST OF SINGLE PART. 5⅜ X 8⅛ INCHES.

The factory has 1,150 pieceworkers on the pay roll and there are about 20,000 piecework prices. During a recent year the average earnings per hour of the pieceworkers for the entire factory was 45 per cent above the average day rate.

The Clearance House and Inspection Department.

The "Clearance House" is a unique feature of an uncommon plant and the system herein described has been successfully applied in the handling of an immense quantity of stock in a business where a large number of parts are required to each machine, numbering as high as 2,500, and where, if any delays were to be experienced, it would be a very serious and costly matter. This system has taken care of the handling of about 200,000,000 pieces of stock in the one year with a limited machine room capacity. In the handling of all of this immense amount of stock no delays whatever were experienced in the assembling departments. While in most manufacturing concerns it cannot be strictly followed out in the following details, yet there is no question that it can be adapted to any manufacturing business with great profit.

All stock, of whatever nature, that is received into the factory, is here inspected before it is turned into the stock room

with the clearance house sheets. The original of this order is sent to the foreman of the department doing the work, there being a foreman for each separate department, such as milling, bench filing, gear cutters, drilling, screw making, punch press, etc., and the order goes to the foreman having the first operation on this particular stock. The stock, when delivered from raw material, is sent to the machine room in the proper size boxes; these boxes all have their separate and individual numbers. A card is sent through with the stock and put into a metal pocket which is placed on the side of the boxes, and this card is to accompany the stock all the way through the factory.

The clearance house sheets correspond in every respect with the card which accompanies the stock as regards box numbers, lot number, etc., and upon this sheet is put all data as to the amount of stock, time consumed on operations, price, number of pieces lost, workman's name, etc. See Figs. 8 and 9. The different operations through which this work is to be put are written on both the sheets and cards at the left hand sides.

When stock is sent out to the machine room for an operation a record is made on both the card and the sheet stating number

delivered and the day of month, the card accompanying the stock to the machine room; when that operation is finished, the stock, together with the card and also the "time ticket," which is either a piecework or a day-work ticket, is returned to the clearance house. These time tickets must accompany the stock coming from the machine rooms in all cases, and unless they do the stock will not be received in the clearance house.

When the stock comes into the clearance house and inspection room the cards and time tickets, either piece or day-work, are turned over to the clearance house clerks, who enter all data from the time tickets on the sheet, Fig. 9, corresponding to the card, these sheets being retained in the clearance house office on files all the time until the stock is finished and ready for the finished stock room. The stock in the meantime has been unloaded on the inspector's benches and as soon as the "time ticket" has been entered up and stamped by the clearance house clerk, it is sent out to the inspector. The stock is carefully gauged by the inspector and the piecework ticket is O. K.'d by him for whatever amount may be correct, and the number of pieces lost or rejected is noted in the proper column on this piecework ticket, the workman being paid only for the amount O. K.'d by the inspector.

The cards and the piecework tickets are then turned in by the inspectors to another clerk, who enters on the card the number of pieces O. K.'d by the inspector as correct, and enters in the last column the number of pieces lost, if any, and also puts down the date, together with the initial of the inspector who did the work, in the column provided for that purpose and marked at top "inspected." This makes a perfect check on clerks and inspectors.

The piecework tickets are again stamped "inspected," with the date, the original being sent to the Piecework Department and the duplicate is sent back to the department from which the work came. The duplicates are given back to the workman after being entered to his credit by the department clerk in a book provided for that purpose. The original being sent to the Piecework Department, one serves as a check against the other, and if any mistakes should be made they can be detected easily and quickly.

The cards, after being O. K.'d by the clerk for the inspection operation, are then sent out to the inspectors who put them in the proper boxes waiting for the next operation, and a moving ticket is made out in duplicate, the original being sent to the foreman in whose department the next operation is to be done, and the duplicate is placed in box pockets together with the card. When this foreman is ready to perform the work (stated on moving ticket) on the stock, he sends in the original of this ticket, properly signed, as an order to have the stock sent out to him. This is done immediately and the card is turned into the clearance house to have the proper entries made on it, the same entries being also made on the corresponding sheet, as above described, and the stock is then delivered to the department ordering it; the duplicate of ticket is sent with the stock, which is signed by the foreman receiving it as a receipt, and this ticket is turned back into the clearance house.

The clearance house enables the firm to tell exactly where any stock is located, give the quantity, the exact cost to the fraction of a cent, the number of pieces lost in the course of its manufacture, the name of the workman who did the work, together with the piecework prices for it. It is from these clearance house sheets that all the cost records of the factory are compiled.

For each different principle machine that is built cards are used having a distinctive color at the top, showing at a glance to what part of the rooms the stock is to go. In the clearance house at the present time are over 18,000 sheets, which represent that number of boxes of stock in the factory.

This stock, when finished, is sent to the finished stock room, where it is put into the proper bins, on each bin a stock card being used as attached, on which debits and credits are made as stock is received or delivered and by this card the stock keepers are able to tell at a glance the amount of stock there is in the bin.

A limit is fixed as to the amount of stock that ought to be in the stock room at all times, which limit is marked on these cards; whenever the stock in the bins falls below the limit it is reported on the exhaust sheets, which give the exact number of pieces in stock. These exhaust sheets are made out each day and at present they will show probably 600 items that are below the limits and giving the exact number of pieces that are in stock, thus having a clean record provided each day as to the condition of the stock. These exhaust sheets are delivered to each foreman in the factory for their guidance in the machining of parts that are most needed in stock room.

The items of stock reported on these exhaust sheets are examined by the clearance house clerks and the location of the stock in the factory is noted thereon every morning by referring to the clearance sheets. The foremen having any of the stock that appears on the exhaust sheets are then notified of that fact, a list of such stock being sent to them, with a request to have it rushed. In this way the exact condition of the stock can be told at all times and all stock which is in a dangerous condition is taken up and work pushed on it immediately.

The clearance house has absolute authority over all stock in the factory and the foremen are notified at all times what stock they are supposed to work on and give preference.

By means of this system this department handled in one year

No. _____ _____

Name _____

_____

_____

_____ Machine No. _____

Ordered _____ Finished _____

	Name or Check No.	Cost		Remarks.
Toolmaker				
"				
Planing				
Milling				
Patternmaker				
Draftsman				
Blacksmith				
Material				

Total Cost $ _____

Remarks _____

_____

ORDER No.

Supervisor _____

FIG. 12.—JIG AND FIXTURE COST CARD. 4½ X 7½ INCHES.

over 200,000,000 pieces of stock, and there was none of this immense amount of stock but could be located in a moment's time, nor was there any delay suffered in the assembling rooms for the want of stock, even with a limited capacity of the machine rooms. This was done, as stated before, even though there were at times as many as 600 items which were very low. In many cases the stock was in such a condition that, if not crowded through in a very few days, absolute shut down in the assembling rooms could not have been avoided. This immense amount of work has been handled with a total of six clerks, two head stock tracers and one chief clerk.

The work of the inspection room proper, including the inspection of raw and finished stock, is handled by 43 men, who are continually gauging the work with extreme accuracy. Many of the parts are held to within .0005 inch, and even closer, and in no case does the inspector allow over .002 inch variation.

There are in use in the inspection department nearly 5,000 gauges. While this at first glance appears to be a heavy expense for the inspection of stock, the expense per machine is slight and the saving is very large owing to the fact that the machines can be assembled with extreme rapidity due to the accuracy of the parts and to the fact that practically no fitting has to be done in the assembling rooms.

"This system of inspection and stock tracing may not be applicable in its entirety to all manufacturing establishments, as there are comparatively few who inspect the stock after each operation, which is done by the National Cash Register Co. because of the necessity for absolute accuracy. There is no question, however, but that this can be applied to almost every kind of manufacturing business, by keeping a record of stock when it is out for three or four operations at one time. One of the greatest difficulties experienced in ordinary manufacturing establishments is the serious, costly and aggravating delays suffered because of stock not coming to the assembling rooms in such time and quantities as to avoid delays. This system if properly installed and carried out will absolutely prevent this and will do it with a comparatively slight cost."

This last paragraph is the opinion of a careful student of shop management systems and is on that account at least worthy of careful consideration. Inspection systems are common enough and the variations in their application to the work found in the different establishments are as diversified in extent as they are peculiar in type. The carrying out of a theory to the extreme may be as liable to involve difficulties, if not indeed absurdities, as the practice which recognizes the virtues of a plan but hesitates timidly at the thoroughgoing project in its entirety. The plan of the National Cash Register Co. assuredly does not lack completeness in its ramifications. It reaches out into every corner of an immense organization and its influence is a strong tonic, freely administered and acting vigorously upon the mental and physical capabilities of the manufacturing force. The work of the three departments is so interwoven that it is almost impossible to separate the piecework, cost and clearance house details from each other and the writer has attempted to give the operation of each in as complete and accurate a form as possible and some repetition was inevitable. The description in each instance has been received from the head of the particular department and may therefore be considered reasonably correct. Any errors should be set down to the debit of a visitor whose task was made a pleasure by the cordial interest and co-operation of his guides, but who could not be expected to carry away all of the material he was offered so freely.

That the plant is a modern wonder will be frankly conceded by all mechanics who have had the satisfaction of visiting it; but to those who have walked through the well lighted shops at leisure, come in contact with the enthusiastic men of affairs who are shouldering the burden of organization in detail, the feeling that here is an embodiment of the modern army is ever recurring. Here is an organization under the stimulus of a hearty competition from without—the press of invention vigorously forcing designers into an assailing siege that must be defeated by still greater improvement or disarmed by purchase; from within, the pressure is twofold, the inspiration of that truly valuable praise that stands for present financial reward as well as for probable promotion and the avoidance of that blame so easily the result of the general system of complaint. The faultfinder is here cordially invited to exercise his powers and lest the people at home may too readily become accustomed to present conditions and be blinded to their deficiencies by regular contact, the casual visitor is provided with every opportunity to make suggestions and complaints for the benefit of the company and its employes. One may reasonably hesitate at the venturing of a suggestion, much less the tender of a complaint, where everything is orderly, attractive and prosperous, but the suggestion will be received with appreciation, no matter the status of the individual who offers it, and this feeling, so general throughout the plant, is one of the secrets of its prosperity and excellence. This quickness to utilize each and every means of improvement has given a rapidity of development and a unity of organization of an aggressive character, it has by natural process of evolution brought forth a well deciplined body of workers diligently combined and applied as a unit.

On the other hand the force of the individual is not constrained and hampered by the lack of appreciation or the most productive environment, every opportunity is offered him to make the best use of his mental aptitude and his especial craftsmanship. The predominating feature of the individual personnel is the youthfulness of the men in positions of trust and responsibility, the favoritism of sheer worth, the recommendations of native and acquired ability, are the principal factors of the leverage that raises men above their fellows at the N. C. R. plant. With these inducements we may look forward to still greater progress. The vitality that is so evident a factor in the past will assuredly continue to give support in the future. New problems will arise with the passing conditions of the times, but the creative discontent pervading the plant cannot but be productive of new weapons for the later industrial warfare. Meantime those of us who are not of the company at Dayton, but are in cordial accord with the spirit there, will look forward with confidence to the fullest realization of the hopes of its founders and present builders of a most remarkable structure.

R. I. C.

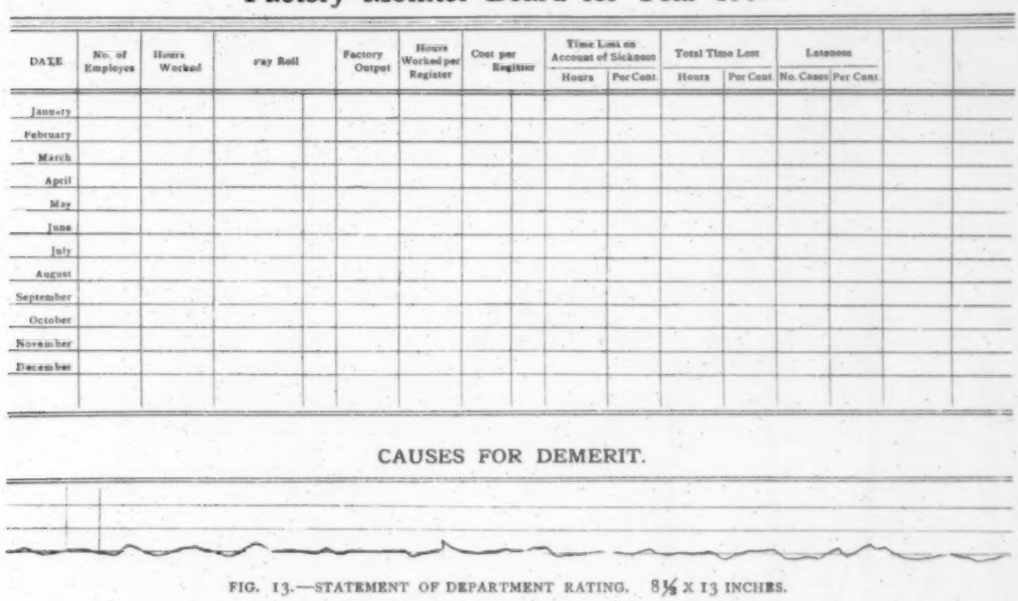


FIG. 13.—STATEMENT OF DEPARTMENT RATING. 8½ X 13 INCHES.

The Durham Furnace, of the Durham Furnace Co., Doylestown, Pa., was blown in last week. The furnace has been idle since last October and has undergone extensive repairs in the meantime.

The Crane Co., of Chicago, is erecting a new warehouse at Sioux City, Ia.

The Evolution of the Ingot Stripper

BY A. E. FAY.

In the earliest days of the art of metal founding, when stone molds were first used, two ways of removing the castings were no doubt suggested. The first was to turn the mold over after casting and lift it off, hammering on it, when necessary, to loosen it. The earliest molds were doubtless of such shape as to render this operation possible. This idea has lasted until the present day. The next idea was to make the mold in two separate parts, which made the extraction of the casting simple. This idea is of ancient origin also, as is shown by a two-part stone mold which was found in an ancient brass founder's kit in Kent some years ago.

A great many kinds of two-part metal molds for ingots have been invented, and of course all metal molds for making castings are made in two or more parts. Removing the castings or ingots from the molds is usually a very simple thing, but still several methods of assisting this operation have been invented. One of the earliest was to provide the mold with a movable side or bottom which could be pushed inward after the mold was opened to eject the casting. This idea has been used in type machines for nearly a century, especially in France; and the device was made automatic at an early date.

Aside from type machines, one of the earliest and at the same time simplest and most practical designs was patented in Sardinia in 1856 by Francesco Gibellini. It may serve to illustrate all of this kind of ejectors. The two parts of the mold were pivoted together, and when opened a projection on one part pushed a pin, which through a lever operated the ejector to force the casting up out of the other part. This idea was extended somewhat a few years later in some automatic machines having moving molds, but was always used for small articles only.

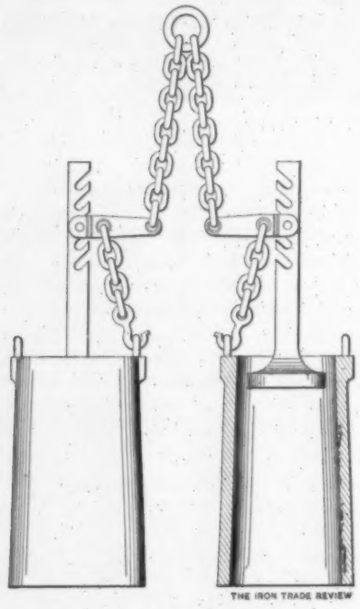


FIG. 1.—JAMES'S INVENTION. FIRST AMERICAN INGOT STRIPPER.

The more obvious use of the two-part mold lay in merely opening it and allowing the casting to fall out. The two parts were doubtless hinged together in the earliest molds, especially bullet molds, and this idea has been applied in many ways to machines using a traveling series of molds. Pettibone's machine, patented in 1819 in this country, is no doubt the earliest of these. The idea of letting the mold parts fall and strike against something when opening, to jar out the casting, was proposed some years later. It has not been found necessary, however, to provide the two-part molds used for ingots with any special means of stripping, and the other kinds of molds mentioned above could not be used for ingots, consequently the subject of two-part molds will now be dropped.

The shape of the earliest one-piece ingot molds has been indicated above. No doubt the earliest ones were very shallow. They very gradually grew taller or deeper until they reached their present shape. Up to a comparatively late date molds shallow enough to permit of being lifted off the ingots by hand, and loosened when necessary by pounding, were employed. Removing them by means of cranes was proposed in the early days of the Bessemer process. It was one of the subjects of a patent granted in England in 1862. Of course, if the ingot did not fall out of the mold when lifted, it would be carried up in it, and had to be loosened by pounding as in the earlier practice.

Mounting molds of this shape on trunnions or pivots, so that they could be easily inverted to allow the ingots or pigs to fall out, should have been suggested at an early date, but no record of it appears that is more than forty years old. Another idea that it would seem should have been suggested long before it was (1878), is the lifting of the pig up out of the mold by means of hooks, rings, notches, or projections cast into or onto the pig itself. Although some of these primitive ideas have been advocated and even originated in comparatively recent years, yet the introduction into practice of the Bessemer process was what made it necessary to find something to replace them; and the real invention in this line dates from that time. In the first place these shallow molds had to be displaced, for several reasons, into which it is not necessary to enter here. Tall molds had to be used, which made it almost absolutely necessary to make them in two parts, or else provide some special means for ejecting the ingot.

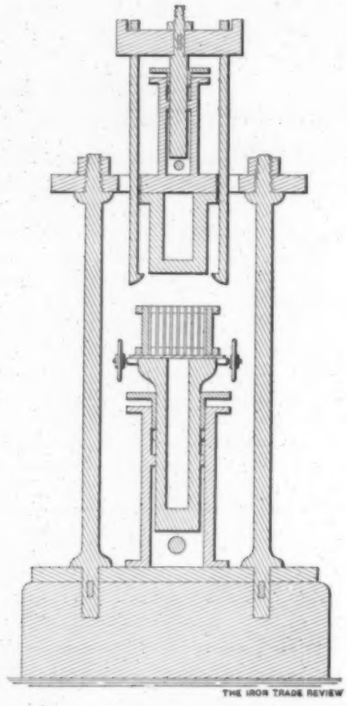


FIG. 2.—PLAYER'S PRESS AND STRIPPER, 1865.

Bessemer's Ingot-Stripping Devices.

It would seem strange indeed if the casting of Bessemer steel should have been suggested at all without some proposition for stripping the ingots, and Bessemer himself suggested two stripping devices as early as 1856. They were of a peculiar design, not in use now so far as known to the writer. In one a plunger was provided working in the mold, the top of the plunger forming the bottom of the mold. When the metal had solidified the plunger was forced upward, carrying the ingot up with it out of the mold, where it was received between two pawls or falling catches fixed to the frame of a truck, running on rails above the mold. Bessemer's other suggestion was to use a stationary standard forming the bottom of a mold. The mold was fitted to slide up and down over this standard. After the ingot was cast and compressed by a plunger above, the mold was lowered so that the standard holding the solid ingot was left projecting up through it.

Another idea in ingot strippers was proposed by Sumner and Waldenström in England in 1869. A hollow plunger was

provided above the mold to be forced down to eject the ingot through the bottom. The mold was for hollow ingots and the core passed up into the hollow plunger when the latter was forced down into the mold. It is to be noted that these strippers all formed a part of the mold.

Alexander Wilson, of Dronfield, England, was the first to suggest a separate machine for stripping ingots, unless the crane could be so designated. He patented it in 1874. The mold containing the hot or cold ingot was lifted out of the pit by means of hydraulic or other cranes and placed underneath the ram of the press. The ram was then brought to bear on the top or small end of the ingot with a pressure sufficient to force it out of the mold. The discharged ingot and empty mold were then lifted out of the way by hydraulic or other cranes, and other molds with their ingots brought in succession under the press in the same manner as described above. The press was fitted with a bed suitably recessed to receive the ingot mold and insure its being readily placed centrally with respect to the ram. The ram was supported in an elevated position by means of weighted chains attached to a cross head of the ram or its equivalent and laid over antifriction rollers. These weighted chains while giving to the downward pressure imparted to the ram would, so soon as that pressure was removed, raise the ram clear of the mold and into a position to repeat its action on the next ingot introduced into the press.

This was followed two years later by Bouniard, in France, who used a stripper with a revolving table. The ingots were compressed in one press and then the table was revolved until they came to the stripper. Its construction is not known.

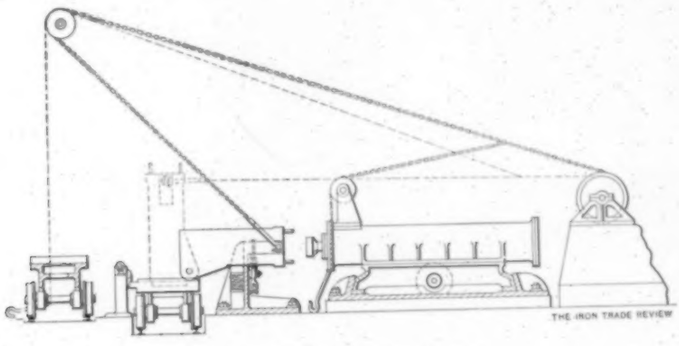


FIG. 3.—LAUREAU'S INGOT PUSHER.

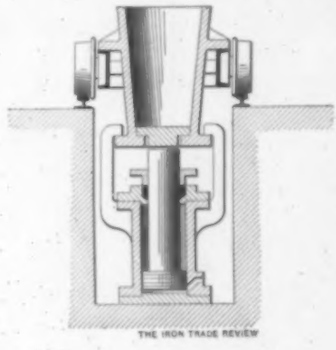


FIG. 4.—POTTER'S DEVICE.

Gibellini's idea without the automatic connection, was employed by J. W. Ells, about 1871, for removing car wheels from molds, but the plunger formed the core of the mold. The idea never reached any nearer the ingot casting art than this, although it has been suggested and improved for the casting of numerous small articles down to type.

The First Invention in the United States.

The first American invention in this line was made by Thomas James, of Braddock, Pa. This has been the basis of nearly all of the progress that has been made since. The idea was to hold the ingot down while the mold was lifted. It is clearly shown in Fig. 1. The idea, of course, was simply to loosen the ingots.

A device using compound levers in a somewhat similar manner was proposed at about the same time by Thomas Hampton, of Sheffield. The plunger, pressing on the top of the ingot, was supported at its top, which extended only a short distance above the mold, by the meeting ends of two levers extending from it in opposite directions. The opposite end of each of these levers was supported by a chain. The two chains were brought together above and supported from the chain on the crane arm. The levers were fulcrumed by the hooks which were pivoted to them and hung down to engage the hooks on the mold. Thus in lifting the whole thing, the weight of the mold itself acting through the levers, was added to the weight of the ingot to force it out, as in James's device.

W. H. Adams also invented an ingenious stripper which may be regarded as an improvement on Hampton's. The levers of Hampton were provided with cams which forced the plunger down as the levers were raised by the chains. It was patented in 1888.

This idea of placing the mold containing the ingot upon a car, bringing a rigid block of metal into contact with the top of the ingot, and then raising the mold off, leaving the free ingot on the car, was taken from John Player, of Norton, Eng. He did not use this idea for casting, it is true; nevertheless it was the same idea. His invention, made prior to 1865, related to "improvement in the manufacture of balls, blooms, or slabs of malleable iron or steel," by moving the metal from the puddling furnace into a mold or form in which it was subjected to heavy pressure. Fig. 2 shows the press and means for raising the mold off the bogie after the whole thing has been lifted into contact with the lifting device.

Over 20 years ago, S. G. Laureau made an innovation in tipping the mold over to a horizontal position and stripping by means of a piston working in a horizontal cylinder. It is shown in Fig. 3. This device was improved by Capt. Wm. R. Jones and Samuel T. Wellman a few years later. The Jones "ingot pushers" were first installed at the Edgar Thomson Steel Works in 1888. A complicated device for handling ingots, gotten up by Thomas Brady, of South Chicago, also embodied this principle. This is a distinctly American device, but only these four have been designed, no improvements having been made since 1890.

About this time a great change was introduced in this art. In Bessemer plants, in this country at least, all of the old ideas were substantially abandoned with the exception of the one originated by Player and improved by James Hampton and Adams. Only one device of any other type has been designed in America since 1890, and that is not intended for Bessemer plants. As shown in Fig. 4, it is seen to follow one of the ideas advanced by Bessemer nearly half a century ago. The inventor is J. A. Potter. Although all the early inventions, except that of James, were made in England, practically all the progress in this line since 1890 has been made in America.

Late Developments Almost All in This Country.

The Patent Office records generally afford significant indications of the state and history of an art, and it may be of interest to note here that since 1890 only two ingot strippers have been invented and patented outside of this country. One came from Wales, and will be referred to later. The other consisted merely in a solid base, having a depression in the center, and four guide posts extending upward at the sides. The mold was to be dropped into it, and the ingot being loosened by the jar, would fall into the depression in the block. This idea was patented in England in 1896.

As is well known the cause of this abrupt change was the introduction of the car casting system in this country by F. W. Wood. In view of the ideas which had previously been brought out, his most important invention perhaps lies in the construction of the mold itself. Formerly the molds had usually been lifted by means of small loops or ears in the sides, which projecting above the upper ends of the molds were liable to become covered or filled with metal. They were also weak. The idea of dispensing with the hammering of these molds while suspended, by holding the ingots down and at the same time pulling the mold up and away from it, had been proposed, as has been stated by Player in 1865, and later by James and others. Also the idea of having integral lugs had been suggested by Wm. Hainsworth and W. R. Huisdale. Neither of the latter had however discovered the proper shape for these lugs, and moreover neither of them used the molds

in the same way. The form adopted by Wood is well known and is shown in Figs. 5, 6, etc. It is somewhat curious that although Wood has been responsible for most of the improvements in this line, and has done more than any one else to bring the system into practical operation, he never secured a patent until September last, with the exception of one in collaboration with Henry Aiken. He has been without adequate protection for ten or twelve years, but his patents will now be in force for 17 years, so he will probably lose nothing by this state of affairs.

The Aiken Patents.

The inventions of Messrs. Wood and Aiken are well known and need not be described in detail. Although Wood has not been particular to obtain patents, Aiken commenced to take them out in 1890, and has received about eight. His improvements have been of various kinds and several of them are represented by Fig. 5. It will be noticed that he uses Wood's mold here, although in several of his patents he retains the form with the cast in links or loops. This illustration shows the holding ram, the tongs, the sliding carriage or trolley on

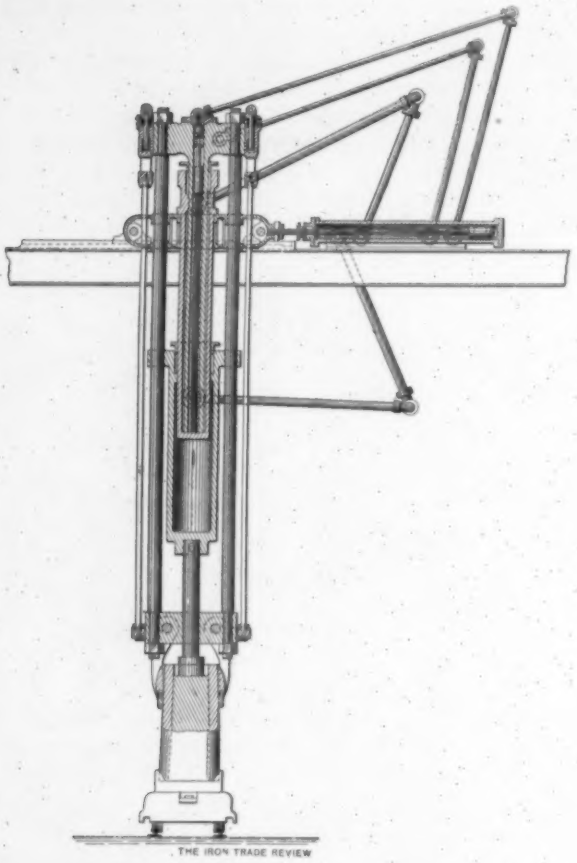


FIG. 5.—ONE OF AIKEN'S DESIGNS.

which the device is mounted, all operated by power cylinders and the flexible connections for the latter.

Aiken's inventions represent two ideas: first, holding the mold suspended and positively forcing the ingot down and out of it, and second, holding the ingot down while the mold is lifted out. In spite of the inventions of Player, Sumner, James and others, he claims to be the inventor of both. Nearly all of his improvements have been made in the second. Aside from the one shown in Fig. 5, he has invented several devices for operating the various parts which are well known. His most interesting improvements relate to the operation of the tongs or grips. In the earliest of these the holding down ram works inside the mold-operating ram, which of course is hollow. A shoe provided with an external upwardly extending ring is removably secured to the lower end of the first ram. The tongs or links are pivotally mounted on a yoke secured to the lower end of the hollow ram above, and have arms pivotally connecting them with a ring sliding on the other ram below the yoke. The ring on the lower end of the central ram supports the sliding ring when this ram is raised with respect to the mold-operating one, thus holding the links out of contact with the mold. But when the central ram is lowered the sliding ring descends, and by its weight pulls the links inwardly into contact with the mold and under the lugs. This device is too well known to require illustration or further description.

Another idea which he has adopted is to suspend the tong levers from above at points near enough together to cause them to close upon the mold by gravity. They are operated to release the mold by levers with a cord attached to them and extending back to the operator. Aiken and Wood took out a patent in 1894 on another device for operating the tong levers which consisted of a plate through which they passed and which was operated by a piston to force them apart when it ascended, and allow them to fall back to engaging position when it descended. Wood has recently patented an improvement of this which consists in an "automatic lock" to prevent disengagement of the levers during the stripping operation. The locking is accomplished by making the levers of the shape shown in Fig. 6. Wood also proposes to operate the levers positively by means of a small hydraulic motor located on the stripper, that is, on the cylinder carrying the ingot-holding ram.

The arrangement of the two cylinders is a very important matter. Aiken's first idea was to hold the mold suspended on the jib of a crane and force the ingots out by means of a ram mounted on a carriage sliding on the crane arm. This had to give place to the other idea mentioned above, but in changing from one to the other, he at first merely changed his crane

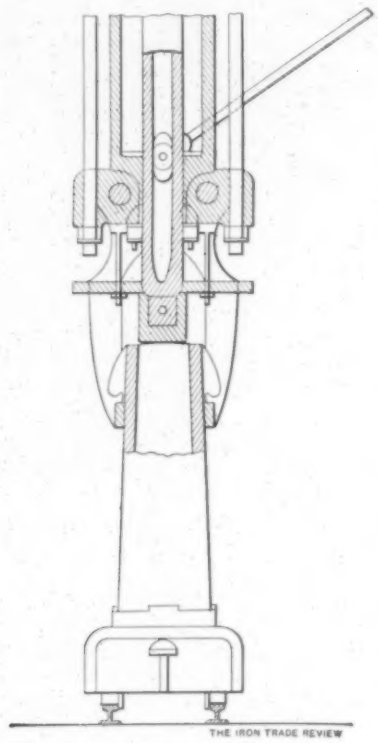


FIG. 6.—WOOD'S LATEST INVENTION.

by the least amount necessary to accomplish the desired result. A crane was therefore designed in which the jib supported the mold by chains as before, but was raised by one or more hydraulic cylinders. The holding down ram was operated by a cylinder mounted rigidly upon the mast of the crane. His next idea was more original and was the basis of the later improvements. In this the two cylinders were in vertical alignment and the mold-operating ram was hollow so that the ingot holding one could reciprocate inside of it. This machine has been referred to above. Aiken has also somewhat modified the form shown in Fig. 5 as to the relative location of the two cylinders.

Earlier than Aiken, J. F. Lewis suggested the use of a frame attached to the slide and supporting two cylinders, one extending upward and the other downward, so that the two plungers were in vertical alignment. The lower plunger was used as the ingot stop and the upper one had two depending rods each provided with a hook at its lower end to engage the lugs on the mold.

Samuel Forter and James Hemphill invented a device in which the ingot cars were supported on a yieldingly supported platform. Links held the mold at its original height while the ram forced the ingot out, the platform being forced down at

the same time. This was only to loosen the ingots. Afterwards, the ram being withdrawn, the platform with the ingots was permitted to rise again and the ingots reassumed nearly their original positions. The continued ascent of the plunger caused a collar attached to it to engage with a yoke supporting the links, thus lifting the mold off. It will thus be seen that one plunger loosened the ingot and afterwards lifted the mold.

Another plan for a vertical stripper was proposed to the American Institute of Mining Engineers in 1891, by Gram Curtis. A 30-inch ram with 11-inch stroke was to work upwards from below to carry a support for the mold, which was hollow, to allow the ingot to drop into it. A smaller ram with longer stroke, directly above, held the ingot down by means of water caused to be imprisoned above the piston at the proper time, while the lower ram forced up the mold support and mold. The support thus received the ingot while the mold was being removed by the crane, after the upper ram was withdrawn. This has not been patented.

This completes the last of what may be called the older inventions in this line. During the past two and one-half years several other forms have been brought out or patented which may be of interest.

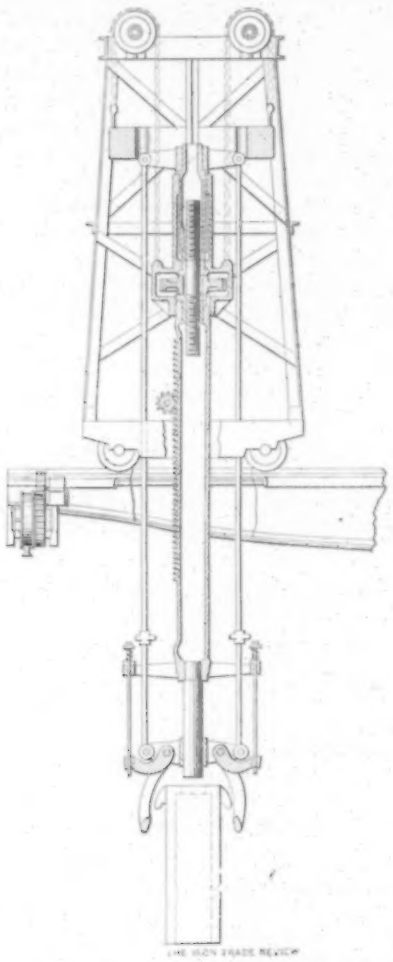


FIG. 7.—MORGAN AND TAYLOR'S MACHINE.

The Kennedy Device.

Mr. Julian Kennedy's improvement is in those machines which use two plungers, one to lift the mold and one to hold down the ingot, and was designed to prevent the ingot rising a short distance with the mold and then dropping back. It consists in a lock which holds the stop down firmly and automatic means for releasing it after the mold has been raised a certain distance. This is accomplished by means of a pair of clutch bars mounted on the stop and arranged to engage two stationary bars extending down from the cylinder. They are disengaged by the upward movement of the cross head which carries the tongs levers.

The Welsh invention mentioned above is very well known, having been described in all the important trade papers of Europe and one or two in this country. One of them was erected some time ago by Crawshay Brothers, in Cyfarthfa, Wales, and is said to have been operated very successfully by Bolckow, Vaughan & Co., at their Cleveland steel works. The inventor, John Evans, of Merthyr, Tydril, follows Mr. Wood's ideas in the main. He uses three rams, the middle one being for holding down the ingots and the other two for lifting the mold. The latter are each provided with two portions of different cross sectional areas, the larger being used at the first part of the stroke to loosen the ingot, and the smaller afterwards, when only enough power to lift the mold is required. After the side rams have ascended a short distance, they automatically pick up the central ram and carry that up out of the way. The device is very ingenious and would be given a more extended description if it had not been fully exploited in the trade papers.

The three latest strippers which have been designed are those of W. H. Morgan, C. L. Taylor and G. K. Roberts, of Joliet, and S. S. Wales, of Munhall, Pa. The first named is built by the Wellman-Seaver-Morgan Engineering Co. One of them, set up by the American Steel & Wire Co., at Worcester, Mass., has been fully described in several of the papers. It consists of a rack bar having the ingot plunger at its lower end and supported from the "tower" by a counter-weighted chain and having at its upper end a casing containing a right and left hand screw and nuts which operate the grips below.

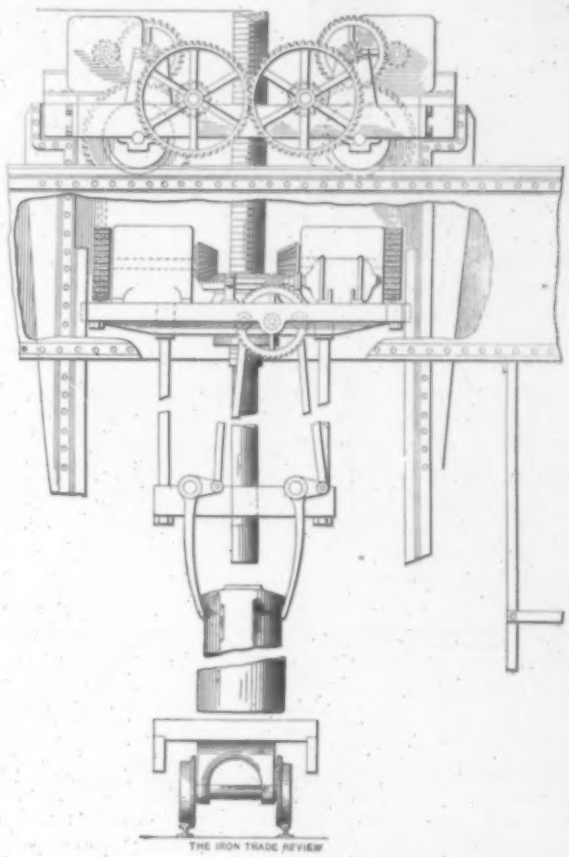


FIG. 8.—WALES'S RECENTLY INVENTED STRIPPER.

The rack bar is operated by an electric motor, the screw by another, and the trolley carrying the tower by a third, all supported on the trolley. The square shaft arrangement which these inventors have used in other lifting devices is employed in the screw-rotating mechanism. It is shown in Fig. 7. Wales also uses electric power. His stripper is illustrated in Fig. 8, and will not need further explanation.

Roberts' device is considerably different from the others in principle. Several cars bearing ingots in molds are brought onto a movable platform, supported by two power operated arms brought under its ends. Four power operated arms are then brought into contact with each mold, two of them engage under lugs formed on it and serve to hold it up, and the other two bear against the top of it to steady it. The arms holding the platform up are now withdrawn and the latter is drawn down by a hydraulic ram. The molds being held up, the ingots descend with the platform and cars. A plunger is provided over each mold to loosen the ingot if it does not drop out. All these arms are operated by hydraulic means.

As has been said, the latest inventions in this line to be patented are those of F. W. Wood, which have been described. One of his patents covers the mold itself, and the application was pending in the patent office nine years before the patent was received.

A MULTIPLE GAUGE FOR LATHE WORK.

A multiple gauge for lathe work has been invented by Edmund J. Bowers, 2125 Ontario street, Philadelphia. The device is illustrated in Figs. 1 and 2, the former being a halftone representation of the tool and the latter a view of the attachment in position on the lathe. The invention provides a means of quickly finding the desired positions of the lathe carriage and tools when a number of faces or parts of a piece of work are to be turned at different measurements, either

FIG. 1.—A MULTIPLE GAUGE FOR LATHE WORK.

in the length or the diameter of the stock. The attachment is obviously capable of application to other machine tools than the lathe and on the latter may readily be modified for use in conveniently locating the position of the cross-slide on the carriage as well as the position of the latter on the bed.

The clamp A has a grooved projection on the back planed out to fit the vees and the clamp is held in position by a setscrew binding the bracket firmly to the lathe. The turned bar B is fitted to a hole bored through the clamp A and at one end of the bar B is a fork C holding a number of gauge blocks or holders D. These swing on a pivot at C and are bored out at E and provided with setscrews for the gauge rods F. A number of small adjusting screws are contained within the forked casting C and the blocks E have lips resting against the screws so that by means of the lips and screws the holders and gauge rods may be adjusted level with each other or raised above the level shown in the illustration. The hub, to which the shank B is fitted, is split and has a clamping screw G to fasten it securely in any position. This clamping device is best illustrated in Fig. 1.

The gauge rods F are arranged to come in contact with a block H on the top of the lathe carriage. Ordinarily the block has a recess wide enough to meet all the gauge rods one after the other. The block is not absolutely needed in all cases as the end of the lathe carriage will often supply all the contact surface required.

In the case of a piece of work like the cone pulley, shown on the arbor in the lathe, having four faces to be finished in turn by the cross feed and tool, the gauge rods are selected and adjusted and all the gauges but one thrown up out of the way, as in the illustration, Fig. 2. The one gauge down meets the block H when the tool is in position to finish the first face of the work. When this face is turned, the gauge is thrown up with the others and the second gauge brought down and the carriage moved to the right until the second gauge drops into the recess of the block H when the second position of the tool is reached. The successive positions at which the several cuts are to be taken may thus be quickly and positively found. In practice it frequently happens that where a number of similar pieces of work are to be treated, they are not all located upon the arbor in precisely the same place and it may be necessary to adjust the bar B to right or left in making the first cut. After this adjustment no other changes would be necessary.

The bar B and the clamp may be of a very varying shape to the one illustrated but the multiple feature of the device is the main characteristic and this is capable of embodiment in other forms to the one shown in Figs. 1 and 2. The form illustrated has been selected however because of its evident simplicity and it is not intended that the inventor limits himself to this design entirely.

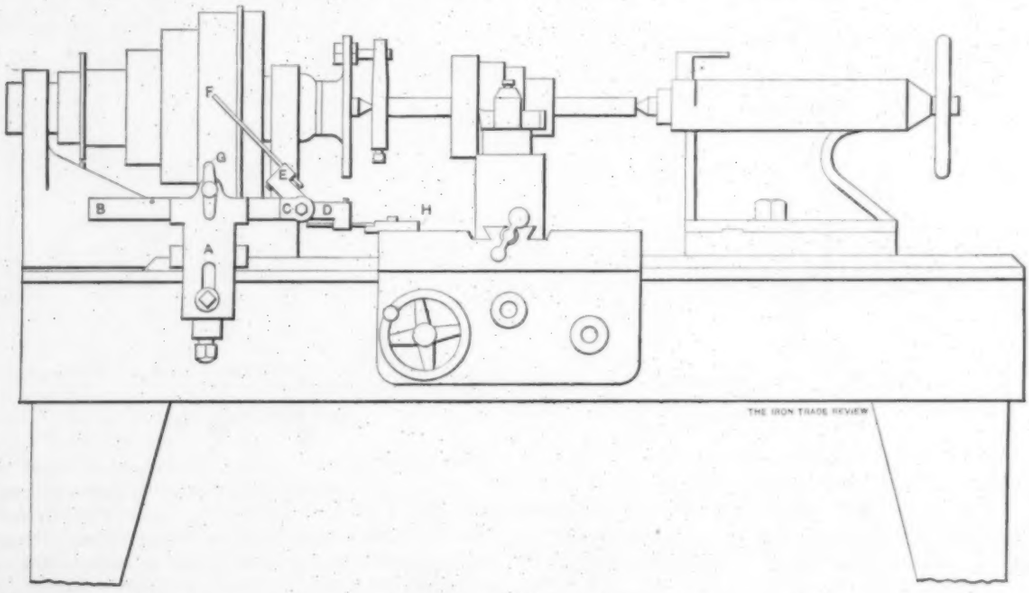


FIG. 2.—MULTIPLE GAUGE APPLIED TO LATHE.

The Chester, Pa., *Times* has gathered together a statement of the number of men employed in various industries in that city. In iron and steel the number is about 4,000, distributed as follows: The Tidewater Steel Works, nearly 700 men; the South Chester Tube Works and the National Tube Works, each close to 500; the American Steel Casting Co., 450; the Penn Steel Casting Co., 400; the Seaboard Steel Casting Co., 350; Wetherill & Co., 350; the Chester Iron & Steel Co., 225; the Solid Steel Casting Co., 200; the Chester Steel Casting Co., 200; the Crum Creek Rolling Mill, 200; the Gruson Iron Works, 125; the Frankford Forge, of Tindel, Morris & Co., about 75; the Johnston Switch Works, 75, and Black's Axe Factory, 60. There are still about 300 men working in the shipyard, which in its palmy days employed 1,500. The textile industry employ nearly 4,000, and altogether the number of wage-earners in the various industrial plants in Chester is now about 12,000, the largest number in the city's history.

GANG BOSSES IN MACHINE SHOPS.*

BY WILLIAM LODGE, OF CINCINNATI.

In speaking of the subject of "Gang Bosses," it is necessary in order that a fair understanding may be had of the subject, to give some idea of the general get-up of a manufacturing machine shop. The idea advanced herein would not apply so well to jobbing establishments or establishments where a very large variety of work is done, as the manufacturing idea is very difficult to carry out in such establishments; but where the work is of such a nature that duplication may be taken advantage of, I think you will readily see the wisdom of some of the points I aim to advance.

The ideal manufacturing establishment is where duplication is carried on to such an extent and work is made in such quantities that it will pay to expend money for a special machine for each individual operation, if such special machine would permit a sufficient saving to justify its cost. Ordinarily this would be carrying manufacturing to a point far beyond what any one establishment does, outside of the makers of typewriters, sewing machines and agricultural machinery. But there is no reason whatever why the same idea may not be applied to the manufacture of machine tools, etc., only that it would mean an amount of enlargement to any plant requiring an enormous addition to the capital and a market that would be of sufficient magnitude to receive the stream of machines that would be made, just as the market received sewing machines. These conditions are, of course, hard to obtain and the best that can be done is to approximate as nearly as possible what we know to be the ideal set of conditions.

It is exceedingly difficult in any establishment gotten up on the capitalization plan, to find men who will take a sufficient amount of interest; first, to decide upon just the management that will bring it out successfully; next, to be willing to buckle on the harness and get down to the kind of hard work that such a situation requires.

Let us suppose some establishment in need of such a man and being unable to find him in its own works, advertises or answers the advertisement of some man looking for such a position. After the preliminary talk has been had, the party who wishes to engage the new superintendent is impressed with the idea that he has the right man, and forthwith hopes to unload his responsibility onto the shoulders of an utter stranger, in many cases a man not having been engaged even in the same line of business. I predict in every case this will prove a bitter disappointment, and for the following reasons:

The party who has been running the establishment, having been with it perhaps from the beginning of its existence, has naturally picked up the detail from day to day, month to month, year to year; and so gradually, that he carries an enormous load with a reasonable amount of ease. But the new man, without having the advantage of years to acquire the knowledge of this particular business and pick up the little items which are so necessary for the manager to know, finds himself loaded with so much work for each day that he would surely break down under it if he attempted to carry it through, and I have no doubt a great many of you have seen such experiences. Consequently, the natural result would be failure, even allowing that the man had extraordinary ability.

If we had 200 tons of merchandise to be hauled and had only one horse to haul it, we should hardly expect to load the whole 200 tons in one load, but should divide it up and let the one horse take one ton at a time. It is just as necessary in loading a man with mental responsibility to divide the load as it is with a load of merchandise; and nine-tenths of the superintendents who accept positions of this kind fail because they are expected to carry the 200 tons instead of the one ton only. Unfortunately, neither the man that engaged him nor the superintendent himself knows that this is the real fault; and yet this same fact holds good with a foreman being engaged to take care of 20 to 50 men, just as clearly as it does to a superintendent who has all the men as well as all the foremen to take care of.

Being a practical man, I call to mind certain experiences of my younger days that impressed it upon my mind very clearly. During those days there were certain times that piece work was called for, and in my first experience of this I had the privilege of using two or three lathes if I cared to, and had in charge about five others on which other operatives were employed. Being ambitious and desirous of making a good showing, I tried to run two lathes but soon found that both lathes were suffering, both in the feeds and speeds and also in the attention required, and very often both would be stopped while mandrels, reamers, drawings, tools, etc., were being looked after. I found that by using the little intervals of time between starting and stopping a cut on one machine, these intervals could be used to the best possible advantage in looking up the drawings, tools, etc., and more work produced in a given time than if an attempt was made to run two machines. Further, in endeavoring to keep the other five operatives at work, I soon found that my attention was so much taken from the regular line of work in order to see that the various operatives had a clear understanding of their work and also that their machines were stopped while they were looking up the mandrels, reamers, drawings, tools, etc., that I decided to try the experiment of not attempting to do any work but to endeavor to accelerate the work done by each one of the five other lathes and to get from each one nearly as good a quota of work as I myself could turn out. I found this not only successful but very much easier for all concerned, and that the five machines were kept going thoroughly well, and that the product for them was increased to such an extent as to more than make up for the little amount that could have been done by myself in addition to looking after the work. This gives an idea of the "gang boss."

If the conditions surrounding the work can be made agreeable, a "gang boss," by reason of his closer affiliation with the man, can act and talk with a freedom that the foremen would find impossible; he can infuse a spirit that would be impossible for a foreman unless he was a man of very special ability. Each man is fully on his mettle, and as each should be a competent workman, it would be a continual endeavor of the poorest to reach the value of the best, and if any dead wood existed means would readily be taken to exchange it for another workman better qualified for the work in hand.

It is not to be expected, however, that this system can be inaugurated today and be working in the loveliest manner tomorrow. It is like all organizations; it requires some time and a good deal of patience, as well as considerable tact and a knowledge of human nature and how to take advantage of its little peculiarities. If the foreman or manager lacks these qualifications, the system of "gang bosses" would then not be nearly as successful nor would such results be obtained.

The average machine shop operative generally lacks the necessary foresight to study or even to know anything of cause and effect. By this I mean that being shown a piece of vise work required to be fitted in a certain manner, his ideas do not go beyond to the point of what is the intention of this piece of work; what it is going to do; what it is expected to perform. And by not reasoning in this manner a fit is made a thousandth too tight or a thousandth too free, either of which may spoil the job. Consequently, some one must supply this defect in the make-up of the operative, and while a man may be able to do it for a limited number, when it comes to a large number it is impossible for one man to teach each and every one what the intention of the piece being fitted is.

If the distribution of supervision is carried to a sufficiently small number of units it will give much better results and will be less costly both in the work and in the number of spoiled pieces. I think it might be well to express it in this way: Given a shop employing say 500 men, and a competent manager being needed to operate said shop, the owners of the institution should be able to see within a short time that if said manager is unable to handle properly 500 men, then the work should be distributed and two men should be given 250 each, which is dividing it by two. If this is not successful, divide by four or five, or even ten or twenty, if there comes a necessity for it. Of course, in making such a division they need not all be men of the first grade. We no doubt all of us know the impossibility of getting such men. Again, it very frequently happens that men are engaged as managers of manufacturing establishments whose education has been largely technical, business or drawing room experience, and who because of

*Prepared for the Cincinnati convention of the National Metal Trades Association.

never having absolutely measured themselves on the lathe, or planer, or vise against the best workman in the shop, are utterly unable to judge as to their capabilities for the different positions in which they are placed. It is the same as if a man of this kind, with all the technical knowledge possible, were set to supervise a number of lathes and expected to get the best results from them.

Let us for a moment look at the difference between this man's knowledge of the work he is to supervise and even an apprentice boy who has been employed in the department, say six months. The technical man while going through his technical experience has been allowed, of course, to make a piece of work, mount it into the lathe, bore it, face it, put it onto a mandrel, turn it to size and length, and has probably consumed five hours in doing so. And were he to attempt the same piece again in his new position, the chances are it would be with the same results. But the apprentice boy who has worked in the department this one man is to supervise would take that same piece, and instead of consuming five hours would lay it down a finished piece of work and a first-class job in possibly fifteen minutes.

It seems, therefore, utterly wrong to put as a supervisor over a boy a man possessing so little knowledge of the actual doing of the work; and yet this is being done continually and results are expected, with a consequent great disappointment.

I could occupy your time quite a little in describing to you some of the men who have presented themselves as managers, willing to accept big salaries, and then showing their utter inability to earn even one-fourth such salaries, as compared with the men whom they were engaged to supervise.

If, then, our industrial establishments have been reorganized on the plan of "gang bosses," taking care of three to ten or fifteen men according to the nature of the work, we are bringing forward men who are capable of finally supervising larger numbers. Of course, many of these will be tried and found wanting, but the shrewd proprietor will with care be able to select from among them men who can advance his interests far better than attempting to use men as supervisors who have not had the actual practical experience. Such men will be able to do not only as good work, but as much as the best machinist employed on such work.

Had I the time, I could elaborate on the various departments necessary to make up a successful institution, such as the drawing room, pattern room, tool room, lathe room, planer room, vise room; the necessity for the proper handling of the work as well as the proper handling of the men; the installation of suitable industrial railways; the avoidance of spoiled and wasted work; the attention necessary even to the item of casting, cleaning and moving of the work from one department to another; the general cleanliness of an establishment and its results, but I have no doubt you are thoroughly well tired of the subject by this time.

Study of Electrical Devices in Steel Works.

Through the courtesy of the Carnegie Steel Co., upwards of 200 members of the Engineers' Society, of Western Pennsylvania, Pittsburg, were permitted to see the uses and workings of electrical devices in the Homestead plant on Tuesday evening, April 22. The visitors were shown through the entire plant and all marveled at the growing uses to which electrical devices are being put. The central electric power station was the first place visited. The huge generators in this plant provide all the current required, not only for lighting, but also for the operation of the various electrical devices. The visitors were then divided into small parties and the various mills inspected. All the traveling cranes in use at the plant are operated electrically, as are the charging machines for the heating furnaces. In many portions of the plant electrical power is fast supplanting hydraulic power, and with the exception of the operation of the big slab shears it is believed that the substitution will be complete. The Engineers' Society has gone into the subject of the use of electric motors in mill work extensively of late with a view of demonstrating to users of this patient piece of mechanism that too much should not be expected of it, despite the fact that the amount of care bestowed thereon is much less than on almost any kind of machinery. In addition the loading of the motor to twice its capacity has to an extent condemned the device in the eyes of some because it broke down at the critical moment. It is the desire of the Society to aid in educating users of the motor so that they shall give it the same care as other mechanical devices and to lay stress on the fact that it is no fault of the machine, if properly built, that it breaks down when not receiving the proper attention and care.

DETAILS OF THE STEEL CORPORATION'S BOND PLAN.

The directors of the United States Steel Corporation have sent to the stockholders notice of the special meeting of May 19 in Hoboken, N. J., to act on the four resolutions adopted by the directors at their meeting on April 1 relative to the issue of $250,000,000 5 per cent bonds and the retirement of $200,000,000 of preferred stock. Accompanying the notice is the following circular from the executive committee to the stockholders:

April 17, 1902.

To the Stockholders of the United States Steel Corporation:

Your corporation having completed the first year of its existence, the management, after a careful study of the operations of the several subsidiary companies during that period, and as a result of frequent consultations between the presidents and managers of the companies, and a minute study of the several properties by engineers, now submits to you a plan that meets with the approval of your executive and finance committees and of all the members of the board of directors present at the April meeting.

At the time your corporation was organized it was expected that great economies in manufacturing would be accomplished. As stated in the preliminary report issued on Feb. 17, 1902, such expectations have been realized to the extent possible through practical co-operation, common methods of accounting, and frequent interchange of views between the managements of the several plants.

By the acquisition during the year of additional ore, coal and steamship properties, the subsidiary companies have been placed in a satisfactory position as to raw materials and transportation facilities. The main object still to be accomplished is to harmonize further the several properties through such rearrangement and extension and, in some cases, such modernization as will produce a completely-rounded system of co-ordinated plants adapted to the entire process of mining and transportation, and of transforming raw materials into the highly-finished products of the several companies at the lowest cost.

Economies in manufacture still greater than those which already have been accomplished may be effected if plans of improvement now proposed be carried out. It is estimated by the executive committee that the expenditure of about $25,000,000 for such improvements will effect a saving in manufacture of, say $10,000,000 annually, and also under normal conditions would substantially increase the output, thus adding from $10,000,000 to $15,000,000 to the yearly profits. That these expenditures could be met gradually from surplus earnings the management does not doubt; but this would necessitate extending them over a period of years, and correspondingly would postpone the realization of the profits which, by the immediate use of the money, could be obtained promptly.

In Feby., 1901, various subsidiary companies had under contemplation, and in many cases actually had begun, the construction of additions to their plants, which in some instances would have duplicated the facilities of other subsidiary companies. The aggregate of these contemplated expenditures was something like $50,000,000. As stated in the preliminary report of Feb. 17, 1902, much that at the time of organization it was hoped might be accomplished in the way of avoiding wasteful expenditures for unnecessary enlargement of plants, has been accompanied by co-operation among the several companies enabling one to utilize the facilities of the other. However, owing largely to advance commitments, it was impossible to stop all construction at the time your corporation was organized; and, in order to finish work then under way, cash payments have been made during the year to the amount of $15,000,000.

It was not possible then to determine how much of this contemplated expenditure of about $50,000,000 would have to be

made, nor in advance of sufficient experience would it have been wise to capitalize any part of the $15,000,000 that have been actually expended.

Within the next few months will fall due payments, aggregating about $10,000,000, for properties purchased almost immediately after your corporation was organized. In the preliminary report to stockholders these payments were described as "purchase-money obligations."

$25,000,000 for Improvements.

The executive committee unanimously is of the opinion that it is desirable immediately to carry out the plans of the management to effect the completely rounded system above referred to. The finance committee is unanimous in its support of the executive committee's recommendations, and believes that, as desired by the executive committee, $25,000,000 should be made available for improvements. The finance committee also recommends capitalizing both the $15,000,000 expended during the year for commitments made prior to your corporation's organization, and the $10,000,000 yet to be paid for properties as above stated. These three purposes in the aggregate call for $50,000,000.

The problem confronting the finance committee has been to make provision for this $50,000,000 without issuing preferred stock, which stock can not be sold at less than par and which, if sold at par, would be entitled to dividends at the rate of 7 per cent, and would increase by $3,500,000 the present annual dividend requirements of the corporation.

The suggestion was made that preferred stockholders might be willing to exchange a portion of their stock for bonds of the corporation, bearing a lower rate of interest, their concession of income on the portion of their stock thus exchanged being compensated, first, by the consideration that such bonds as should be given in exchange for preferred stock would generally be regarded as a higher order of security, and, second, because the prompt employment of the new capital so to be obtained would additionally guarantee the permanence of the present dividend rate on the remainder of their preferred stock.

After discussion with some of the principal stockholders, it appeared practicable to rearrange your corporation's capitalization (which, in round numbers, now consists of $300,000,000 of bonds, $500,000,000 of preferred stock and $500,000,000 of common stock) by substituting for $200,000,000 of the preferred stock $200,000,000 of sinking fund 60-year 5 per cent mortgage gold bonds, and by selling $50,000,000 additional bonds of such issue for cash. As the preferred stock carries 7 per cent dividends while the bonds would bear but 5 per cent interest, the $50,000,000 desired could, in this way, be added to the corporate resources, and the aggregate of the annual charges for interest and dividends instead of being increased $3,500,000 would be decreased $1,500,000 as compared with the present sum total of these two requirements.

The question whether the management would be justified in recommending an increase in the bonded debt has been exhaustively considered. The unanimous conclusion of the finance and executive committees is that, considering the vast aggregate value of the physical properties, the proposed $250,000,000 increase of bonds from $300,000,000 to $550,000,000 is wise and conservative, the preferred stock issue being simultaneously decreased 40 per cent, or $200,000,000. The consequent $14,000,000 reduction of dividend payments as compared with the $12,500,000 increase of interest would result in a net annual saving of $1,500,000, exceeding by $490,000 the annual sinking fund contribution of $1,010,000 to be required by the proposed mortgage and which, invested at 4 per cent, would be sufficient in 60 years to pay off all of the $250,000,000 bonds.

The Year's Earnings Four Times New Interest Charge.

An increase of bonded debt under such conditions, for such purposes and with such prospective results, is further justified by consideration of the net earnings of the properties, amounting in the past year to $111,000,000 (being fourfold the entire interest charge of $27,500,000 when and if the bonded debt shall be increased as above proposed) and which net earnings, by the consummation of important improvements, will be protected against the contingencies of periods of adverse business conditions. That the sinking fund may surely earn 4 per cent interest, a provision will be put in the bonds reserving to your corporation the right, any time after ten years, to call them at 110, which is better than a 4 per cent basis—thus making it certain that your corporation, by purchasing its own bonds, can invest its sinking fund on at least a 4 per cent basis. During the first ten years that the bonds are running your corporation, to the extent required for sinking fund purposes, may buy the bonds in the open market, provided, of course, that they can be purchased on a basis that will yield at least 4 per cent.

To offset the exhaustion of ore beds, coal lands, and deterioration of plants, various sinking funds are now being maintained. The further provision of this additional sinking fund to retire the proposed new bonds is in effect, equivalent to retiring 40 per cent of the preferred stock in 60 years, without increasing the aggregate of the present interest and dividend charges—in fact decreasing them by a net saving of about $500,000 a year. To do this, and also to obtain the substantial benefit of $10,000,000, or $15,000,000 annually from economies in manufacture, and additional output by reason of improvements, is the aim of the present plan.

The plan thus outlined can be put in operation only after two-thirds in amount of both the preferred and common stock present or represented at the stockholders' special meeting, called for May 19, shall have voted to issue $250,000,000 of new 5 per cent 60-year sinking fund gold bonds, to be paid for by the preferred stockholders exchanging $200,000,000 of their stock for a like amount of the new bonds; the additional $50,000,000 of bonds to be sold for cash. To further the success of the plan, there has been formed a syndicate including some directors which will receive four-fifths of the 4 per cent compensation to paid under the contract with Messrs. J. P. Morgan & Co., mentioned in the notice of stockholders' meeting.

As in round numbers there are outstanding $500,000,000 of preferred stock, and it is proposed to issue $250,000,000 of new bonds, the board has directed that each preferred stockholder shall be offered the right to subscribe for the new bonds to the extent of one-half of his holdings in preferred stock, 40 per cent of each subscription to be payable in preferred stock and 10 per cent in cash; that is to say, the holder of 100 shares of preferred stock of the par value of $10,000 can subscribe for $5,000 of the new bonds at par, and pay for them with 40 shares ($4,000) of his preferred stock, and $1,000 in cash; or he can exchange such 40 shares for $4,000 new bonds without subscribing for any new bonds in cash. Preferred stockholders who do not wish to exchange stock for bonds will not be required so to do or to purchase any new bonds for cash.

If you approve the proposed plan and cannot be present at the meeting, will you please execute the enclosed proxy, and return it promptly in the accompanying envelope. After the stockholders' meeting has been held, and the plan shall have been ratified, ample opportunity to avail of its benefits will be offered to the holders of preferred stock.

CHARLES M. SCHWAB, President.
ELBERT H. GARY, Chairman Executive Committee.

Ashland Iron and Steel Co.'s Chemical Plant.

The Ashland Iron & Steel Co., of Ashland, Wis., has added a chemical plant to its charcoal furnace property, for the purpose of securing the by-products arising from the carbonization of wood, and the new plant has just been successfully started. It is one of the most complete of its kind in the country. Electricity has been largely used as motive power. The stockholders of this company are also the stockholders in the West Colby Iron Mining Co., at Bessemer, Mich. This company has been incorporated with the Ashland Iron & Steel Co., and the mine will be known as the Yale. A large body of high grade Bessemer ore has been developed. To cover the above improvements and additions, the capital of the Ashland Iron & Steel Co. has been increased to $1,250,000. The officers are: Joseph H. Berry, president, Detroit; Wm. G. Smith, secretary and treasurer, Detroit; W. H. Hinkle, acting vice president, Ashland, Wis.; E. J. Burrell, superintendent chemical plant, Ashland; L. E. Dunham, manager furnace department, Ashland.

The Kalamazoo Railway Supply Co., Kalamazoo, Mich., has decided to erect a malleable and gray iron foundry.

The Machinery and Metal Working Trades—News Letters from Selling Centers.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST.

NEW YORK, April 29.—The month of April in the machinery market in and around Greater New York was not characterized by any great rush of business. Manufacturers and dealers alike report a healthy demand, which was uniform in its tendency throughout the month. Transactions were so widely distributed that there is scarcely a concern which has cause for complaint. Inquiries were numerous. Some of them resulted in good orders being placed, while many others have only reached the formative stage in that direction.

Among the concerns which received large orders was the Niles-Bement-Pond Co, which made a sale through its Pittsburg office of some $60,000 worth of standard heavy machine tools, the purchaser being the Alliance Machine Co., of Alliance, O. The same concern was also busy in other branches, the demand for its cranes being especially good.

Orders for small tools were plentiful, with considerable dissatisfaction expressed over the inability to deliver them promptly. This has operated as a serious drawback in many ways. Concerns engaged in the manufacture of chucks have been hard pressed with hurry orders. The Cushman Chuck Co., of Hartford, Conn., according to its Mr. Cushman, who was in New York last week, is three months behind in its deliveries.

Among the manufacturers of taps, dies and drills, a similar state of affairs was noted. At the New York offices of the Etna Mfg. Co., of Taunton, Mass., it was stated that the orders for such goods were so numerous during April that it was found necessary to almost double the force at its plant to fill them, even with running day and night.

The Vermont Farm Machine Co., of Bellows Falls, Vt., was a large buyer of machinery and machine tools during the month. Several firms figured in the orders. In a few days the company will begin the manufacture of fast running centrifugal machines. It is having great difficulty in getting machinists. Its representative was in New York during the past week trying to get hands. He consulted with the officers of several local machinists' unions but failed to accomplish his purpose. Accordingly he inserted an advertisement for 50 machinists in a New York paper on Sunday. The company will shortly begin the erection of a three-story addition to its present plant, the equipment of which has not yet been purchased. Another large storehouse will also be erected.

Manufacturers of mining machinery are looking forward with a great deal of interest to the termination of the Boer war, concerning which cable dispatches give such great hope. With the cessation of hostilities in South Africa will come the opening of the mines, which have been closed for two years. At the New York offices of the Rand Drill Co., Mr. Rand informed the writer that he thought there would be considerable activity in their South African business, which consists mostly of drills, etc., when peace was formally announced. At the New York office of the Ingersoll-Sergeant Drill Co. Treasurer Doubleday expressed a similar opinion, but said that the country was in such a topsy-turvy state, in consequence of the war, that it would take some time to restore it to a condition where business activity would be productive of results.

Announcement was made during the week that work had been begun on the foundations for the new machine shops and foundry of Henry R. Worthington, at Harrison, which directly adjoins the thriving city of Newark, N. J. From a reliable source the information is given that the equipment of the new works will necessitate an outlay of $500,000 for machinery alone, and the necessary tools. The latter will consist of traveling cranes and all kinds of machines and tools used in the manufacture of pumps and hydraulic machinery. Engineer Wallace, who is in charge of the construction, is now at work on the specifications for the equipment. The probabilities are that proposals for the same will be received in about three weeks. It is the intention to have the new equipment the most perfect of its kind obtainable, and no expense will be spared in this direction. The new works, which are expected to be in operation in about a year, will cover 35 acres, and will give employment to 4,000 hands. They will cost over $500,000, exclusive of equipment. Both the machine shop and foundry will be 1,000 feet long and 150 feet wide. With the departure of the Worthington pump works from Brooklyn, that city will lose its largest industrial establishment. Incidentally, it may be remarked, one of the finest manufacturing properties in Greater New York will be thrown upon the market. It covers nearly two large city blocks, and the buildings for the most part are in a good state of preservation. The reason the concern is going to abandon them is that they had grown too small for its business, which seems to be constantly on the increase. Another reason is that they are separated from the foundry at Elizabethport, which is a journey of about six hours by water, so far as the transmission of castings is concerned. This has operated as a serious drawback in many respects, especially when hurried orders were received. At the new plant, the fact that the machine shop and foundry will directly adjoin each other will, it is believed, greatly expedite the concern's business.

The offices of the International Steam Pump Co., which have heretofore been located at Van Brunt and Rapelyea Sts., Brooklyn, will in a few days be located on the first and second floors of Nos. 114-16-18 Liberty street, New York. President John W. Dunn requests that all communications after today be sent to that address.

The New York office of the L. S. Starrett Co., of Athol, Mass., which for several years has been located at No. 126 Liberty street, is now at No. 123 Liberty street. It is in charge of A. W. Briggs. The company's business recently has been of a most satisfactory character. Many large orders for mercury plumb bobs of all sizes have been shipped recently. Great difficulty is experienced in keeping up with the demand for machinists' steel rules, the sale of which is now the largest ever known.

The Bristol Co., of Waterbury, Conn., has had so many inquiries of late for the patent steel belt lacing it manufactures, in and around New York, that it has decided to open an office at No. 114-16-18 Liberty street, in order that they may be given proper attention.

The business of the Columbia Engineering Works, at Imlay and Williams streets, Brooklyn, has increased so rapidly recently that the company is now erecting a new engine and boiler shop to meet it, on a site several blocks distant from its present plant, and overlooking New York Bay. Most of the equipment has been purchased, and is expected to be installed in about six weeks.

American manufacturers of pumping machinery are anxiously awaiting the awarding of the contract for a 5,000,000 imperial gallon pumping engine for Montreal, Can., which is to be driven by electricity against a pressure of 26 pounds per square inch. Proposals will be received up to noon on May 6. Heretofore proposals of this kind have been of a character to make American competition difficult, if not impossible, but in the specifications in question, it is claimed there is no cause for complaint on this score, hence the interest manifested in the awarding of the contract.

Local machinery houses, with foreign connections, have been advised that Stork Freres, Hengelo, Holland, are in the market for everything requisite for the installation of large sugar refineries which a Dutch syndicate is going to erect in Brazil. They are particularly anxious to hear from those who manufacture electrical sugar machines of all kinds, cane crushers, dynamos, and motors.

The General Supply Co., of No. 40 John street, dealer in all kinds of machine tools, reports an unusually brisk business of late. On several occasions it has been forced to avail itself of the assistance of competitors to fill orders.

The Chapin-Love Machine Co., of No. 129-31-33 Worth

street, is busy in all branches of its work, particularly in the making of drills, the demand for which has grown considerably during the past fortnight. The company is building a large number of machines for the Tube Bending Machine Co., preparatory to putting them on the market. These machines, according to report, bid fair to take a prominent place among the labor-saving devices introduced recently. It is claimed that they can take a coil of brass pipe, ranging from one-quarter of an inch to two inches in size, and cut and polish it in less time than ten men would require to do it.

Walter Crooke, Jr., of the Frodingham Iron & Steel Co., of Frodingham, Eng., is in the United States. This company is about to erect two additional blast furnaces which is the principal reason for Mr. Crooke's visit to this country.

Maurice Graham, of the British engineering firm of Graham, Morton & Co., Ltd., Leeds, Eng., is on a three-weeks' visit to this side and is now stopping at the Hotel Manhattan, New York. Mr. Graham is investigating coal handling machinery and will visit Chicago, Pittsburg and Cleveland.

L. Grimsey, of Yokohama, Japan, manager there for the American engineering firm of Bagnall & Hilles, is in the United States, and has headquarters at the General Electric Co.'s New York office.

Gus F. Meehan, vice president and manager of the Monterey Iron & Steel Foundry, Monterey, Mex., is now in the United States for the purpose of placing contracts for equipment, machine tools, etc. The capacity of the Monterey plant is to be doubled and it is also proposed to manufacture gas engines there. Mr. Meehan is now in the West.

Jno. A. Roebling's Sons, 119 Liberty street, New York, have secured an order for about 75 miles of insulated wire to be used for police and telephone service in Manila.

Friedrich Fuchs and G. H. Nicholaus, engineers of the German State Railways, are now in this country inspecting American machine shops, locomotives, etc., They will not actually place any orders while here but everything that interests them will be made the subject of a report to the administration of the railways with the result that a number of orders are likely to come to this country. Speaking of American machinery in the German railway shops, Mr. Fuchs said that considerable American machinery, including air compressors, pneumatic tools, drillers, planers, etc., was installed, some of the orders having been filled by Schuchardt & Schutte, which concern has a local office in the Beaver Building, 120 Liberty street. The Ludwig Loewe shops at Berlin, which are modeled largely on the American plan, also supply machinery of American type, and the German Niles Co., which acquired some time ago the German patents for the manufacture of the specialties of the Niles Tool Works Co., Hamilton, O., also furnish large amounts of machinery for the German state roads.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING.

PITTSBURG, April 29.—The prosperity in the iron and steel trades, which means so much to this territory, is having a wholesome effect on the general machinery market. Expansion is the order of the day at all the mills throughout the Pittsburg district and the machinery manufacturer usually comes in for the greater portion of the expenditure for additions and extensions. New construction also continues unabated and millions of dollars are being expended here this year in the erection of new plants for the manufacture of iron and steel products. Machinery manufacturers and dealers with one accord declare that the month of April was the best in the history of their trade. The month of March was a record breaker, but April exceeded all predictions and expectations.

Large orders were taken during the month by the Mesta Machine Co., United Engineering & Foundry Co., Brown & Zortman Machinery Co., Westinghouse Machine Co., Westinghouse Electric & Mfg. Co., and the Harrisburg Foundry & Machine Co. While the amount of business closed by these concerns was extremely large, unfilled contracts on their books are more numerous than ever and from indications the present year promises to make a new record so far as the local machinery trade is concerned. The outlook for future business is also excellent. Within a month the United States Steel Corporation will announce the improvements that have been decided upon for its various constituent companies and on plants in this district fully $10,000,000 will be expended. As is customary, much of this money will be spent with local manufacturers and local dealers, and the large amount of machinery that will be required insures an extremely bright outlook.

The Mesta Machine Co., whose plant is located at West Homestead, Pa., has become one of the largest builders of heavy duty Corliss and blowing engines in the country, in the past 18 months. The five pairs of blowing engines ordered by the Illinois Steel Co. for its South Chicago, Ill., furnace plant last year, are now all in position and in operation. A duplicate of No. 5 engine was contracted for last week by the same company to be installed at the Joliet, Ill., furnace plant. These engines are equipped with a new air valve recently patented by the Mesta Machine Co. and which is giving much satisfaction. The sixth pair of blowing engines ordered are horizontal cross-compound condensing with 44-inch high pressure and 84-inch low pressure cylinders, 84-inch air cylinders with 66-inch stroke. This pair complete will weigh 900,000 pounds. Coming through the plant the company has a 45-inch blooming mill and a pair of 46x60-inch reversing engines for the LaBelle Iron Works, Steubenville, O.; a pair of 50x60-inch horizontal reversing engines for the Alan Wood Iron & Steel Co., Conshohocken, Pa.; a 24-inch train of rolls containing a universal mill and a bar mill for the Colorado Fuel & Iron Co., Denver, Col.; five pairs of steeple type, cross-compound blowing engines with 44-inch high pressure and 84-inch low pressure cylinders, and 84-inch air cylinders with 60-inch stroke, for the Union Steel Co., whose plant is under erection at Donora, Pa.; three steeple type high pressure blowing engines for the Lake Superior Power Co. In addition many roll lathes, shears and other rolling mill equipment are coming through the shop, some contracts being so large that they cannot be filled for fully six months.

The Wheeling Mold & Foundry Co., Wheeling, W. Va., has recently booked large contracts for sheet and tin plate machinery. The contract for the sheet and tin plate machinery for the new mill to be erected at Marietta, O., was awarded this concern. Work is progressing favorably on the contract for all the tin plate machinery to be installed in the plant of the McKeesport Mfg. Co., which is under erection at Port Vue, near McKeesport. The Wheeling concern is doubling its capacity for making chilled rolls.

All the five plants of the United Engineering & Foundry Co. with headquarters in this city, are crowded with work. Last week a heavy shipment of rolling mill machinery was made to the Colorado Fuel & Iron Co., consisting of three 10-inch rod mills and one 14-inch rod mill from the Lloyd Booth plant of this company at Youngstown, O. The Frank-Kneeland plant in this city recently made a heavy shipment of rolling mill machinery to Mexico, for installation in the new iron and steel plant under construction at Monterey. The McGill plant is crowded with orders for tube making machinery while the roll business is reported excellent.

The Brown & Zortman Machinery Co., Wood and Water streets, last week closed a contract for furnishing all the punching and shearing machinery, cold saws, rotary planers, etc., that will be required in the new structural fitting shop of the West Virginia Bridge & Construction Co., Wheeling, W. Va. Another large order taken during the week was for a lot of miscellaneous tools for the plant of the Oil Well Supply Co., near Oil City, Pa. This concern reports a tremendous business during the month of April, the total being larger than during any month since its establishment. The supply business is also reported good.

The local agency of the Rand Drill Co., with offices in the Park Building, reports the following recent sales of air compressors: Baker Mfg. Co., Tarentum, Pa.; Wheeling Bridge & Construction Co., Wheeling, W. Va.; Pittsburg Filter Co., and W. B. Scaife & Sons Co.

The Charles G. Smith Co., dealer in machine tools, 347 Fifth avenue, reports a large demand for grinding machinery, of which it makes a specialty. This company represents the following concerns: Hill Clarke & Co., Eastern Machinery Co., The Safety Emery Wheel Co., Wilmarth & Mormon Co.,

manufacturer of twist drill grinders and the George Gorton Machine Co., manufacturer of high grade disc grinding machines.

Taylor, Wilson & Co., Ltd., Allegheny, Pa., are shipping a carload of tube making machinery per week to the new tube plant of the Sharon Steel Co., Sharon, Pa. The output of this company's works is contracted for for the next six months.

The Riter-Conley Mfg. Co., Pittsburg, has been awarded a contract in the week for the erection of a smokestack, over 300 feet high at Mapimi, Mex. This will be one of the highest steel stacks in the world and will require about 400 tons of plates in its construction. At present the company has under construction three furnaces for the St. Clair Furnace Co., one of the constituent companies of the Crucible Steel Co. of America, at Clairton, Pa. The amount of business that is being done in saddles for steel plants is enormous, being much larger than at any time in the history of the iron and steel trade.

The Pittsburg office of the Allis-Chalmers Co. has been awarded the contract for the erection of a blowing engine at the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O. It will be of the vertical compound condensing type with steam cylinder 46 inches and 88x60, air cylinders 76 inches and 76x60.

The Link-Belt Engineering Co., through the management of the Pittsburg office has just completed the installation of a 200-foot rod conveyor at the plant of the Union Steel Co., Donora, Pa.

The R. D. Nuttall Co., Pittsburg, reports the situation entirely satisfactory, with its entire plant in constant operation and large orders ahead. New equipment and machinery is being added as fast as the machinery can be secured. A prominent addition to the gear machinery consists of a gear cutter that will take in gears 30 feet in diameter and 5 feet 6 inches in face.

The Greensburg Foundry & Machine Co., manufacturer of boilers, engines, pumps, gray iron castings and mine supplies, contemplates doubling the output of its plant owing to the large amount of business booked. A little over a year ago business came so fast that it was necessary to double the plant and it is probable that the daily output will be increased from 15 to 30 tons daily. The company will also shortly commence the manufacture of pressed steel cars for mines and will install a large amount of machinery for that purpose.

The Keystone Driller Co., Beaver Falls, Pa., has shipped within the last three months three drillers for testing placer ground in Africa to the Ivory Coast gold fields. One was also shipped to Servia. Last week one of the largest type drillers was shipped to Johannesburg, S. Africa, and a placer testing machine was shipped to Dawson City, Yukon Ter. The company has also completed a new style machine within the last six months designed for going to a depth of 2,500 feet.

The Pittsburg office of the Chicago Pneumatic Tool Co. is doing a large business with foundries and iron and steel plants in this territory. The entire business of the Chicago Pneumatic Tool Co., of Chicago, is reported to have been 100 per cent greater during the month of April than during the same month last year. Several of the company's plants will be enlarged in the near future to meet the increased demand for pneumatic tools.

The Union Steel Casting Co., Pittsburg, reports plenty of orders for light and medium weight castings and is in position to make very prompt deliveries on heavy steel castings.

The Stanyon Engineering Co. in connection with its engineering work has taken on the agencies of the following concerns: Pittsburg Steel Shafting Co., Braddock, Pa.; the Aultman Co., Canton, O.; Spicer Mfg. Co., New Philadelphia, O. The company is now engaged in doing the engineering work for the Cramp Steel Co., Toronto, Ont., this work being done at the Toronto office of the company.

J. D. Lyon & Co., merchant engineers, 331 Fourth avenue, general agents for the Mertes duplex gas engine, report the following recent sales of the Mertes engine of 50 horsepower and over: Chillcott-Evans Chain Co., Allegheny, Pa.; Keystone Mattress Co., Pittsburg Clay Pot Co., Oakdale Cork Works, C. K. Hill Co., O. P. Scaife & Co., M. Lanz & Sons.

The Westinghouse Machine Co., East Pittsburg, has orders on its books for upwards of 50 Corliss engines and was recently awarded a contract for six blowing engines, the manufacture of which is a new departure with this concern. The Westinghouse Electric & Mfg. Co. is operating night and day to fill the large orders on its books which comprise electrical installations for all purposes. The generators for the New York Rapid Transit Co. are now under construction and will be as large as the largest now in use.

The Pearson Mfg. Co., boiler and tank manufacturer, of Allegheny, Pa., contemplates the erection of an addition. The company now has an iron clad building of 125x65 feet and machine shop of 50x50 feet, but as the business has increased the present structures are inadequate to supply the demand of their products. The company employs about 40 men and has contracts on hand for the next 90 days.

Smelter managers still continue to send in orders for briquetting machinery to the Henry S. Mould Co., of Pittsburg, Pa., and the White briquetting press, manufactured by this firm, is now in use at practically all of the large smelting plants on the continent. In addition to this, blast furnace managers are beginning to realize the possibilities of economy through the use of this press, which, by putting fine ores and flue dust into solid block form, gives practically the same conditions as those that prevail where lump ore alone is used. Plans are now being drawn up by the Mould company for briquetting plants for several large iron and steel manufacturers in Western Pennsylvania and Ohio. The new testing plant of the company, equipped with a press and the necessary outfit, is now complete and the company is prepared to give practical demonstrations of what the press can do on flue dust or fine iron ore.

Hyde Bros. & Co. make the following report regarding their business: "We have over 6,000 horsepower at the present time on order and under erection to be used on blast furnace gases, direct coal firing and utilizing the waste heat from coke ovens, heating, puddling and other furnaces. We are erecting boilers at the present time in the States of New Jersey, Pennsylvania, Delaware and Missouri, and have boilers under construction to be erected in Ohio, Missouri and Alabama. We are contemplating the erection of a modern and well equipped plant for the manufacture of our boilers and other similar work. We find a greater demand for light rails for mining and similar purposes and for standard section rails for street railway purposes than we can supply, as the mills are pretty well fitted up with orders and the railroads are using their relaying material for sidings and branch extensions.

The Harrisburg Foundry & Machine Works, Harrisburg, Pa., reports that the business of the company is the largest in its history. For the past three years it has been working day and night with two complete sets of men. It is making extensive additions to the new plant by constructing a new pattern shop building which is 50 feet wide by 160 feet long. The space now occupied by the pattern shop in the main building will be used as an addition to the machine department. The great demand for four-valve high economy engines has necessitated the addition of more floor space and the installing of a lot of new tools. Among recent orders received for these engines are the following: One 250-h. p. for the Biloxi Electric Light Co., Biloxi, Miss.; two 300-h. p. and two 450-h. p. each for the New Astor Hotel, New York; two 600-h. p. each for the Hopewell Light, Heat & Power Co., Princeton, N. J.; one 250-h. p. for the Empire Building, Pittsburg; one 500-h. p. for the Metropolitan Electric Co., Reading, Pa.; two 500-h. p. for the Wilmington City Electric Co., Wilmington, Del.; one 1,000-h. p. for the Metropolitan Electric Co., Reading, Pa. In addition to the above orders for the regular Harrisburg standard single valve machines and Harrisburg Ideal engines are under way to the extent of about 7,500 horsepower divided up into small and medium size engines of the single cylinder and tandem and cross-compound types. The company has just shipped a 500-h. p. tandem compound engine for the Dawson City (Klondike) electric light plant.

Wm. B. Scaife & Sons Co., of Pittsburg, has recently taken the following contracts for the Scaife water purifying system: American Sheet Steel Co., for New Philadelphia, O., plant, 1,500 h. p.; A. A. Simonds & Son, Daytotn, O., 200 h. p.; Harrisburg Rolling Mill Co., Harrisburg, Pa., 1,500 h. p.; Antrim Iron Co., Mancelona, Mich., 1,500 h. p.; National Mining

Co., Pittsburg, 1,000 h. p.; Isaac Harter Co., Fostoria, O., 1,000 h. p.

The Pittsburg Gage & Supply Co., of Pittsburg, reports an excellent demand for its White Star filter. A recent shipment was an order for four filters going to the Yarbic Mines, Japan. The company has also recently booked orders for its continuous oiling systems, using the duplex types of the White Star filter—one of 6,000 gallons filtering capacity per day for the Union Steel Co., of Pittsburg, and one for the Citizens' Railway, Light & Power Co., of Mansfield, O., supplying a Cooper tandem compound, a Bates cross-compound and an Allis simple type engine with a continuous flow of clean oil by mechanical means, upon all bearings.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
934 MONADNOCK BLOCK.

CHICAGO, April 29.—The many improvements and extensions which manufacturers throughout this section are making in their respective plants are creating a large business for manufacturers of power transmission machinery, and firms so engaged all report that the number of orders booked and the inquiries received exceed the business of any previous year. The modernizing of old plants and the equipping of new ones has created also a large demand for engines and boilers, and builders of these lines of machinery are as a general rule considerably behind in filling their orders. While manufacturers of machine tools and kindred supplies all note a large volume of trade, dealers on South Canal St. report that there has been a falling off in the business booked in the last month. This may be accounted for by the heavy purchases that were made in the early months of the present year and in the closing weeks of last year, and is not due to any change in industrial conditions. There is still a greater demand for the smaller line of tools than for heavy ones, and orders are reported from all parts of the United States, as well as Canada. Allis-Chalmers Co., Chicago, recently shipped from its works at Milwaukee, Wis., a steel shaft 30 inches in diameter and 34 feet long, with its fittings. The shaft is hollow forged, with a 10-inch hole, and was finished and fitted at the E. P. Allis Works, for use in one of the plants of the American Steel & Wire Co., at Cleveland, O. The actual shipping weight of the shaft was 78 tons. It is intended for a 40 and 80 by 60 combined vertical and horizontal Reynolds rolling mill engine, carrying a rope wheel 23 feet in diameter by 18 feet face. The weight of the wheel is about 138 tons. The total weight of the finished engine is about 500 tons.

Lennox Machine Co., Marshalltown, Iowa, has been compelled in the last six months to increase the output of its plant by the installation of new machines in its machine shop. It has just received from the Jones & Lamson Co., Springfield, Vt., a turret lathe for making cap bolts and studs, etc. The company reports that it is receiving a good volume of orders for gasoline engines and for beveling and splitting shears, and has three orders for the No. 2 beveling shears from Philadelphia, one from the Baldwin Locomotive Works, one from Henry Goldner & Son, and one from the William Cramp Shipbuilding Co.

Charles Munson Belting Co., 38 South Canal St., Chicago, manufacturers of belting and Dermaglutine (rawhide) pinions, reports that it has had a daily increase in orders since it commenced the manufacture of the latter line of goods, and the business today has grown to such an extent that the company is now cutting metal gears. It supplies blanks, plain or flanged. W. C. Groetzinger, the manager of this department, who is the originator of Dermaglutine pinions, was formerly connected with R. D. Nuttall Co., Pittsburg. The gear cutting plant of this company is reported to be one of the best in the city.

Pawling & Harnischfeger, Milwaukee, manufacturers of traveling cranes, have recently booked orders for 45 cranes and hoists.

New Doty Mfg. Co., Janesville, Wis., manufacturer of punching and shearing machinery, is making a number of additions to its plant, necessitated by the increase in business. A pattern storage room, 30x70 feet, three stories high, will be built, also a new pattern shop and an extension to its machine shop of 60x70 feet. The company will also install a number of new tools. It reports that it is in receipt of a larger amount of orders than ever before, and that the amount of work on hand and the orders pending will keep its plant operating to its full capacity for a considerable time.

Illinois Screw Co., 40 South Canal St., Chicago, reports that for the past year it has had all the business it could attend to, and that so long as the machine tool and engine business is good, it expects to be in a like condition.

The Fisher Governor Co., Marshalltown, Ia., manufacturer of steam pump governors, pressure regulators and reducing valves, states that it has had an exceptionally good trade this year, that the year 1901 was the best year's business the company ever experienced and that the three months of the present year exceeded last year's business by 10 per cent for the same period of time. The company recently put a new governor on the market, especially adapted for fuel oil pumps, and reports that it has received a large number of orders from the Texas oil fields for the same. From the present outlook, it expects this year's business to exceed that of 1901 by 15 to 20 per cent. Its foreign trade is increasing all the time.

Curtis & Co. Mfg. Co., St. Louis, reports that, in addition to its line of pneumatic machinery, consisting of small belt driven compressors and a large variety of hoists, it has secured quite a market for a newly designed ice crane. This is so designed that no more head room is required than is necessary for the crane itself, and by the use of one of the company's pneumatic hoists incorporated within the crane, very efficient results are secured. Recent sales of this crane are as follows: J. F. Maynard, St. Louis, Mo., 1; Ice & Cold Machinery Co., St. Louis, 7; Rummeli-Dawley Mfg. Co., St. Louis, 7; Arctic Machine Co., Canton, O., 20; Fred W. Wolf Co., Chicago, 7. The company's business in its whole line of pneumatic machinery is increasing and its shops are crowded with work.

Ransom Mfg. Co., Oshkosh, Wis., manufacturers of Vulcan grinding and polishing machinery, reports that trade in its regular line of grinders is 25 per cent heavier than a year ago at this time. The company has more large inquiries on hand than ever, and expects to land a good percentage of them in the next 30 days. Among foreign orders, it notes one from Japan, several from England and an increasing number from Germany. It has also sold quite a large number of electrically driven water tool grinders and disk grinders.

The H. W. Caldwell & Son Co., of Chicago, has recently purchased the entire equipment of gear patterns, molding machinery, gear cutters and all other appliances pertaining to the power transmission business of the Walker Mfg. Co., of Cleveland. The Walker gears for many years have sustained a reputation for excellence and correctness of design, the Walker system of designing gear teeth being generally recognized as founded upon correct principles. The Walker pattern list is probably the most complete in existence. The Caldwell company states that it is prepared to furnish gears from the Walker patterns promptly and that it will maintain the standard established for these gears by the Walker company.

J. Thompson & Sons Mfg. Co., Beloit, Wis., has recently built and equipped a new plant for the manufacture of the Lewis gas engines, the demand for which, it states, has grown very largely in the last year. It has experienced considerable difficulty in getting raw material from the mills and furnaces, which has seriously delayed them in filling its orders.

Marine Iron Works, Chicago, manufacturers of marine machinery, has on its books orders from the Tabasco-Chiapas Trading & Transportation Co., which does an extensive business in the tropics, for a large amount of machinery; complete stern paddle wheel steamboat work for Zaragoza Mining Co., of United States of Colombia; a pair of 9x36 stern paddle wheel engines for Central America; set of 12 24x72 horizontal tandem compound stern paddle wheel marine engines; steel steamer fitted out all complete for waters tributary to Gulf of Mexico; 80-foot steam yacht for St. Lawrence River. Other foreign countries represented by orders are Turkey, Brazil, Guatemala, Bolivia, Mexico, Ecuador and Canada. The new plant of this company is equipped with electrically-driven power throughout, and nearly all its machinery is new and of modern design.

Marinette Iron Works Co., Marinette, Wis., has decided to remove its plant to Warren, Pa., where better facilities are to be had. It is proposed to erect a foundry 350 feet long and a machine shop 400 feet in length, both built of steel and brick. The

present location of the company's plant at Marinette is between a railroad and a river, and there is no room for extensions.

A. J. Fisher, 50 So. Clinton St., Chicago, manufacturer of the Fisher air compressor, has shipped two compressors to Col. Woods, San Jose, Costa Rica, for bridge work, one to Love Bros., Aurora, Ill., of 150 cubic feet capacity for structural iron work; one to the Newark Iron & Steel Co., Newark, O., of 150 cubic feet capacity, for operating pneumatic tools; one to Winslow Bros., Chicago, of 200 cubic feet capacity, for operating pneumatic tools, and has sold the University of Wisconsin, Madison, steel air receiver and pneumatic tools for experimental purposes in the university.

CINCINNATI.

CINCINNATI, April 29.—The best evidence that the machinery business is in first-class shape is that so many of the machinery builders are enlarging their plants or building new ones into which to remove. All of the concerns in the business report that their trade is very good, more especially the domestic trade, and it is a rather significant feature that the South is a good customer, and there is moving toward the South a large volume of all kinds of machinery that can be used there. Machine tool builders are not having any trouble this year in getting good skilled labor. On the other hand it seems that any machinist who desires work can get it. Manufacturers do not complain about any situation that confronts them, neither the price of castings, the matter of labor nor the volume of business being other than might be expected in a machine tool man's heaven.

The Nichols Dryer Co., recently incorporated under the laws of Ohio with a capital of $300,000, has selected as a site for its plant a tract of land on the B. & O. S. W. Railway in Norwood. Building will begin as soon as possible, and the company will manufacture automatic veneer dryers, lumber dryers, glue presses, spreaders and testers, and many other varieties of special machinery. The officers are: A. S. Nichols, president; H. C. Yeiser, vice president; J. E. Blaine, secretary and treasurer; and these with Charles F. Hofer and O. H. L. Wernicke, directors.

The Cincinnati Planer Co. has secured a contract for a large planer to be built for the Norwood Engineering Co., near Boston, that is considered a good order. The planer will be a 48-inch machine, four feet wide, four feet high and 20 feet long. This company also has taken a number of orders for large planers to go to concerns located in the Eastern States.

The Bullock Electric Mfg. Co. is building one of the largest lathes in the United States. It will be in the new machine shop that is being erected by the company in Norwood and will be large enough to turn up flywheels 44 feet in diameter. The lathe will weigh 200 tons and will require 50 horsepower to operate it. The company found it impossible to get the tool built and had to undertake the work itself. Any concern that might be able to build a tool of the size could not promise delivery, and any that could promise delivery suitable to the company was not able to turn out a lathe of the size. The new machine shop is 177 by 1,200 feet. Of this 250 feet is now under way and will be finished by July 1. The main aisle will be 75 feet wide, 50 feet under crane hooks; side aisles, 51 feet, 30 feet under crane hooks. The building is to be 85 feet high. An extension to the brass foundry and pattern shop will be 200 by 100 feet. A second story will be added, to be used for switchboards and transformers. A two-story service building 50x160 feet is also being added. The company is now building two machines for the Cincinnati Gas & Electric Co., 3,200 k. w. each. One alternating current machine of 4,500 volts, 75 revolutions per minute, and one direct-connected of 300 volts, 75 r. p. m., 38 feet in diameter, weight 660,000 pounds. For the same company there are being built four 450-k. w., direct-connected generators of 150 volts, 120 r. p. m., and two 725-h. p. synchronous motors direct-connected to two 500-k. w. direct-current generators.

The Cincinnati Shaper Co. has closed a deal for property on Spring Grove avenue in the West End, and will remove its shops from Sycamore and Webster streets to the new place as soon as the new building can be erected. The company has been crowded for a long time, and the new plant will give it a great deal of additional space.

The firm of John B. Steptoe & Co., one of the oldest machine tool concerns of the city, has outgrown its present quarters at 75 to 79 Elm street, and has secured a tract of ground on Colerain avenue. Plans will be drawn at once for a new plant, and it is expected that it will be ready for occupancy by fall. The firm has a large business in general machine tools.

Contracts have been let and work will begin at once on the new plant of the American Laundry Machine Co. at Norwood. This concern is one that has a large foreign business right along. There is a continued good demand for laundry machinery from all parts of Europe and from South Africa and Australia. The company is behind with its work, but as soon as the new plant can be occupied it will be in a position to turn out the work on a much larger scale.

Shipment will soon begin on a contract recently taken by the J. A. Fay & Egan Co. for $10,000 worth of woodworking machinery for the car shops of the East Indian Railway. Mention was made in this paper some time ago of the fact that the Cincinnati Milling Machine Co. also secured an order for some of its special work for these shops, and shipment will soon be made.

It is understood that Harry A. Freiberg, who has been until recently connected with the Hilbert-Freiberg Machine Tool Co., will go into the machine tool business on his own account. The name of the company with which he was will remain the same until July 1, and it is understood that soon thereafter Mr. Freiberg will enter the business for himself.

The Lodge & Shipley Machine Tool Co. reports a very large demand for its lathes, there being not a few orders from abroad. This concern is now at work on the extensive addition to its plant that will give it practically 100 per cent more room.

Hoffman & Ahlers, the firm that has a large coppersmithing business and equips most of the distilleries in the country, has secured a contract for the erection of a distillery in California, 40 miles south of San Francisco in the heart of the peach country. The distillery will have a capacity for using up 150 tons of peelings a day, from which there will be a yield of 42 barrels of brandy.

There was a gathering of woodworking machinery manufacturers in Cincinnati last week following the convention at Indianapolis of the National Association of Manufacturers. The meeting was due to the invitation extended by Thomas P. Egan, president of the J. A. Fay & Egan Co., and there were here President Duryea, of the American Woodworking Machinery Co.; Frank F. Wood, president of the F. A. Wood Co., of Boston, and others.

Negotiations are now on which it is expected will result in an addition of capital in the F. M. Watkins Co., manufacturer of laundry machinery. The company by this deal secures the addition of an important Cincinnati capitalist and business man to its directory.

The Bradford Machine Tool Co. reports that its sales for the month of April were the largest in the history of the company.

PHILADELPHIA.

PHILADELPHIA, Pa., April 29.—The volume of business for the month of April has been exceedingly heavy. Orders are plenty and everybody in the line is busy. Prices hold up well, and in the placing of orders do not cut much of a figure. The matter of getting the machinery is the most absorbing. Many concerns are getting wofully behind hand in their shipments, and with the existing demand continuing there seems little prospect of relief for some time. Small tools and equipments of the lighter order are in fair supply, but anything of a heavy character or special in design is slow in the movement through the shops. One of the leading builders here showed your correspondent today a mass of specifications awaiting the attention of the estimating department. Some of these had been on file six weeks and more, the department finding it impossible to keep up with the work. Inquiries in general begin with, "How soon can you furnish?" instead of, as in dull times, "At what price will you furnish, etc." Deliveries are getting to be more and more extended, and are already overlapping the present year to quite an extent.

The matter of supplies is a serious one in many shops. Or-

ders in the various foundries for castings are very slow in fulfillment. Many of the machine shops having foundries of their own are getting castings outside, and this means quite a tax on general jobbing foundries. Pattern shops, too, are very much rushed, a quantity of work usually taken care of in builders' own shops being distributed among outsiders.

Foreign trade is not being looked for to any great extent, and, while it is fairly satisfactory as far as volume is concerned there is so much business offering at home that little effort is being made in foreign markets. Foreign inquiries are very light, lighter than they have been for some time, but this fact troubles no one just now.

The Philadelphia Machine Tool Co. reports a heavy business, its facilities for getting out work being taxed to the utmost. The order book covering all departments, presses, machine tools, and testing machines, is in such shape that there are many months of work ahead. The company is about shipping a large milling machine to the Carbon Steel Co., Pittsburg, which is quite interesting. It is a special machine for preparing test specimens from boiler plate, and mills both sides of the specimen at one operation. The original machine was designed by J. W. Bromwell, the firm's superintendent, but the machine mentioned embodies many improvements in detail. It is arranged to mill reduced area specimens and parallel specimens 18 inches long.

William H. Lucas, the superintendent of the Franklin Machine Works, Philadelphia, is to sever his connection with that concern June 1, and with Frederick and Jacob Espen will establish the Espen-Lucas Machine Works, a new concern which will build cold saw cutting off machines and a general line of machine tools. Mr. Lucas was a member of the late firm of Lucas & Gliem, who were succeeded by the Keystone Machine Tool Works. A portion of the new firm's equipment has been purchased already, but they are still in the market for the balance.

The Pennsylvania Machine Co. reports a good month's business, orders including one from the Union Market Ice & Cold Storage Co., Philadelphia, for two direct connected Chandler & Taylor engines, and another from the Huntingdon & Broad Top Railroad for two 125-h. p. high pressure boilers.

The Franklin Machine Works, Inc., say that they have more business on hand than at any time in the history of the concern and all departments are running night and day under pressure. They are meeting a large demand for their cold saws, milling machines and other machine tools, and recent shipments include a large five-spindle boring machine weighing 30,000 nounds, to Williamson Bros., Philadelphia; a large special rotary cutter and collating machine to the Providence Lithographic Co., Providence, R. I., and several horizontal floor boring milling and drilling machines to parties in various sections of the country.

William Sellers & Co., Inc., are very busy in all their departments and inquiries and orders are plentiful. They are about shipping a large armature press to the British Westinghouse Electric & Mfg. Co., Manchester, Eng.

The J. W. Paxson Co., Philadelphia, reports a good business. They have recently installed Paxson-Warren sand blast outfits, of large capacity, in the Philadelphia plant of the Abram Cox Stove Co., and in the steel plant of the American Bridge Co., Pencoyd, Pa. They have also booked a good many orders for Paxson-Colliau foundry cupolas, among them orders from the Robins Conveying Belt Co., Passaic, N. J., for a No. 16; the Henry Perkins Estate, Bridgewater, Mass., for a 42-inch; Alex. Mitchell & Co., Philadelphia, for a 58-inch; International Steam Pump Co., Tweedvale Works, Elmwood Place, O., for a 72-inch; and the Standard Steel Works, Burnham, Pa., for two 76-inch. They also have an order from the D. L. & W. Railway, Scranton, Pa., for a portable cupola. They are booking some nice orders for Charlier oil fuel brass furnaces, recent installations including 600-pound capacity outfits at the works of the Kitson Hydro-Carbon & Incandescent Light Co., Philadelphia; the Riverside Metal Co., Riverside, N. J., and the Central City Brass Works, Syracuse, N. Y. The demand for foundry supplies of all kinds is very heavy, they state, and likely to be for some time to come.

The American Pulley Co. reports a continuation of good business at its plant. It is taking care of orders pretty well and making fairly prompt shipments. The company's export business is in good shape and orders include early shipments to Australia, New Zealand, and South American countries.

The Wilbraham Green Blower Co. is exceedingly busy on pressure blowers and exhausters, orders sorely taxing the capacity of the plant.

At the Baldwin Locomotive Works business is coming in heavily, the big plant being run to its fullest capacity. Additions to equipment are being made continually but do not seem to count for much, so rapid is the growth of business. Their foundry capacity is being enlarged and when the installations are complete some relief will be obtained in this department. Activity at Baldwin's is generally accepted in this market as a sure indication of prosperity in machinery circles.

The Tioga Steel & Forge Co. is very busy, running night and day. Work on the new plant is progressing satisfactorily, but it will be some time before the company can commence moving its equipment.

The Harrison Safety Boiler Works report a good demand for boilers, feed water heaters and Cochrane separators. The recent additions to their plant enable them to nearly fulfill the conditions of their orders, and deliveries are not hampering to any extent.

Business at the plant of the Tabor Mfg. Co., manufacturer of molding machines, is very good. The works are running to the fullest extent of their capacity, and the overplus of work in some departments is being taken care of by outside concerns. Among the orders booked is one from the Westinghouse Electric & Mfg. Co., East Pittsburg, Pa., for six split pattern power ramming vibrator frame machines for the brass foundry of that concern. The foreign trade of the Tabor Mfg. Co. is growing and some large shipments have recently been made.

"Schoeller-Express" Tool Steel.

The Ternitzer Stahl and Eisenwerke von Schoeller & Co.'s latest product of crucible tool steel is being introduced to the United States, Canada and South America by the International Steel & Machinery Co., of 245 Center St., New York. This brand is known as the "Schoeller-Express," and is made of the best Styrian ore, with some unusual results in high speed work. It is claimed that in a number of tests, made with "Schoeller-Express" tools, cuts of 1¼ inches, with feeds over ¼ inch and a velocity of 175 feet per minute, have been taken. It would seem from a reading of the tests and accompanying data that the limit of efficiency has been found rather in the machine tools employed than in the steel, as when strain on the machine tool becomes great the parts set up a vibration that seriously impairs the ability of the cutting tool. The most valuable quality of a tool steel is its cutting durability, as under otherwise equal conditions the efficiency of a machine tool is thereby not only increased but the cost of production reduced as well.

The following figures are submitted as showing the capabilities of the cutting steel in working homogeneous iron and steel. In each case a cut ½-inch deep was taken and the tool neither ground nor cooled. The actual working time on an iron shaft was 36 hours 27 minutes, with a cutting velocity of 21 to 33½ feet per minute, and the total weight of shavings being 3,461 pounds. The steel shaft had a cutting velocity of 24 to 33 feet per minute during the working time of 34 hours and 26 minutes. In this period, 94 to 117 pounds of shavings were removed to the hour, amounting in the aggregate to 3,448 pounds.

Schoeller & Co. claim that in their department for the production of turned steel shafting, the capacity has been much increased by the introduction of "Express" steel, and that in the department for the turning of railroad axles the "Express" steel tools would last from 18 to 20 hours before regrinding. The steel is readily worked at a heat varying from a light-red to a cherry-red and after forging the tool should be cooled off slowly. Before hardening the cutting edge should be ground off to remove the scale, the hardening heat depending upon the work to be done and should be taken from a cherry-red to a white heat according to the hardness of the work.

Naylor & Co., of New York, importers of iron and steel, and dealers in domestic iron and steel, have opened an office at 910 Frick Building and have placed A. Krum in charge.

The Place of Machinery Agencies in the Selling Economy.

To the Editor:

I cannot but feel interested in the article appearing in *The Iron Trade Review* of April 3, on the subject of "Machinery Agencies vs. Direct Selling." The matter is treated somewhat briefly, and I regret that the writer did not care to venture more freely into a field where he is evidently well acquainted. As I understand the situation the main purpose of the manufacturer is to get his product to a market with as little additional expense as possible; to concentrate his efforts upon the manufacturing side of the business and to get away from the idea of a retail trade. It is the old story of the manufacturer selling through a merchant or jobber to the consumer and with the growing tendency to manufacture in quantities this condition will be more and more developed. There is no doubt that the direct sale of a machine from manufacturer to consumer has its advantages and it may even be carried to the extent of the maker of the machine building the thing throughout himself, doing the work of the molder, machinist, painter, etc., and delivering the goods in person to the consumer. Here would be a glorious opportunity for the manufacturer to circulate around among the users, and it is likely enough that the business following such an effort would be sufficiently personal to suit such a man.

Does the average business man desire this sort of manufacturing? The pioneers, like Maydole with the hammer, or Gillott with the pen, did this kind of work and it was an enjoyable feature of the handicraft days of our earlier history, but the increasing demand for a good thing has crowded the method to the wall and the individual who attempted it today would be sadly crippled in his competition. Of course, I refer to manufacturing pure and simple, not to the building of a succession of articles which have a general resemblance to each other, but no interchangeability between the component parts. This is the essential difference in fact between the modern factory product and that of the jobbing shop.

There is no intention on my part of advocating the general adoption of agencies to the exclusion of direct selling. I am in favor of either or any way to get goods to good people who can be induced to want them. The manufacturer selling one machine may be able to give more practical information regarding his product than the agent who handles several different lines. But this argument needs to be followed cautiously. I have known manufacturers who were poor salesmen, and I am acquainted with a number of men, admirably equipped as agents, but far from having executive ability to qualify as managers of a manufacturing industry.

The instance given where the agent sends out a green representative may be paralleled on the other side. I have a very distinct recollection of one representative who had in all probability never seen the interior of a machine shop other than as an infrequent visitor. This young gentleman, after a little preliminary conversation, admitted his lack of knowledge and said that he had entered the employment but a couple of weeks before. I am well acquainted with some bright and thoroughly capable salesmen who do not belong to that class by any means. One of them has been a superintendent of one plant, possibly others, has represented agents and is now with a manufacturer. It seems to me that the judicious agency is simply taking a portion of the load from the manufacturer's shoulders and naturally will desire to perform that duty in the best way to obtain results. Of course there are agents and agents, and the manufacturer's style may not be the agent's way of doing business, and so on. In either case it is to their advantage to have representatives who can sell goods that will bring credit to the manufacturers.

I have had the opportunity of selling goods direct and through agencies. The disadvantage of the latter plan was the impossibility in practice of the agent handling his business so that you can keep in touch with his campaign for trade. A certain territory is assigned to him, certain requirements are fulfilled by each party. Both manufacturer and agent may bunch their hits in the advertising field or go it alone. Inquiries are turned over to the local agencies when they come in from that district and there is no certainty that the inquiry will be followed up as closely as the manufacturer would have handled it. On the other hand, the agency is restricted to the selling side; the personal acquaintance of a resident agent in that particular state or section is not to be ignored, and the combination is an excellent one.

This agency matter may be carried even further than this stage. Should the manufacturer or the manufacturer's agent place his advertising through an agency? Shall he write his own advertisements or employ an adsmith? Should he get up his printed matter as his grandfather was wont to prepare it or shall he find among his own assistants, or in some other place, a man with a special ability for getting at this sort of thing?

This old idea of the manufacturer doing it all himself is on the wane. The employer who stands around with a check shirt and tattered overalls is leaving us for the farm or the country crossroads. The man who climbs the ladder to adjust the screws in the pulley after you have placed it on the line shaft, and who gets up or down to squint along any piece of work after it has been aligned with all the painstaking care that the shop facilities provide, is moving out with the other remnants of the chalk age in the machinery world.

We are each so dependent upon the other that the agency scheme is more likely to increase than decrease. There may be some gigantic organization among manufactures that will change the whole situation and on the other hand a general "trust" among agents would evolve some new problems. The age of consolidation is here, but the middlemen, the brokers and agents, are still in business and just now have all they can do, thank you. What with worrying the manufacturer for goods and pacifying the persistent customer, the position of the machinery agent in these hustling times is a trying one.

Q.

NEW AMERICAN BRIDGE CO. PLANTS.

We have been officially advised that the American Bridge Co. will concentrate its plants in the Pittsburg district at Economy, on the Fort Wayne Railroad, a short distance from Pittsburg. Shortly before the formation of the American Bridge Co. the Berlin Bridge Co., of East Berlin, Conn., commenced the erection of a large structural fitting shop on this site which consists of 225 acres. When the combination was formed the plant was abandoned. For fully a year the question of centralizing the plants in the Pittsburg district has been under discussion and for a time it was believed that room would be made for the plant either at Homestead or Duquesne. In view of the additions to be built at these plants, however, it was found that sufficient land could not be secured, and furthermore, the sites of both the Keystone and Shiffler plants at West Homestead are desired for the purpose of making additions to the Homestead plant. These two plants are to be dismantled as well as that of the Pittsburg Bridge Co., and the Schultz Bridge Co., the former located at Pittsburg and the latter at McKees Rocks, Pa. The new plant will have an annual capacity of about 150,000 tons of fitted material, making it the largest structural fitting shop in the world. The large eye-bar plant which was to have been erected at the Pencoyd Works, Philadelphia, will be a portion of this plant. In addition to the structural fitting shops there will be a machine shop, assembling department and rivet manufacturing plant. It is also probable that a foundry will be erected. The work of grading the property has already been commenced and it is the present intention to have the great eye-bar plant in operation by September. James Christie, chief engineer of the American Bridge Co., will have charge of the erection of the plant, and he will be assisted by Richard Khuen, assistant engineer in charge of the Pittsburg District.

It has also been decided to centralize the Western plants of the American Bridge Co. on the lake front near Chicago, and a plant for that purpose will be erected with an annual output of nearly 100,000 tons. The Lassig and American plants at Chicago, and the Lafayette, Ind., and Milwaukee plants are to be dismantled as soon as the new plant is completed. While being smaller than the Economy plant it will be almost a duplicate in the arrangement of its various departments.

The Chicago office of the Cleveland Pneumatic Tool Co., H. S. Covey, manager, will be moved May 1, to 403 Fisher Building.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Indianapolis Wire & Mfg. Co., Indianapolis, Ind., has been incorporated with $10,000 capital. J. H. Witty, A. A. Lansberry and H. Carruthers are the incorporators.

The Giebeler Mfg. Co., of Brooklyn, N. Y., has been incorporated with $15,000 capital to deal in machinery and machine tools. E. Giebeler, Jacob Blaum and E. Behringer are the incorporators.

The Washington Monument & Cut Stone Co., Spokane, Wash., is in the market for a 25-h. p. engine and a stone saw. An electric crane will also be purchased to operate on a craneway 100 feet long and 35 feet wide.

The Ohio Malleable Iron Co., Columbus, O., has been incorporated with $150,000 capital to manufacture drop forgings, malleable iron castings, etc. F. K. Newman, J. D. Cockran, Sherman Leach, K. W. Holmes and F. H. Price are the incorporators.

Old Dominion Nail & Iron Works, Richmond, Va., will issue $500,000 of bonds for the purpose of making improvements, purchase of additional property, etc.

Asheville Ice & Coal Co., Asheville, N. C., wants to exchange a 10x12x24 steam actuated air compressor for a belt-driven compressor about 10x10.

Harriman Sharp Sand Co., Harriman, Tenn., is in the market for hoisting engine and boiler, cables and conveyors for loading sand.

Superior Supply Co., Bluefield, W. Va., which was recently incorporated with a capital stock of $100,000, is having plans prepared for the erection of rolling mill, foundry and machine shops. H. S. Brown, Bramwell, W. Va., will furnish particulars.

Coat Lumber Co., Coat, Miss., is in the market for 14x20 or 16x20 engine and 100-horsepower boiler.

Gate City Stove Works, Catlettsburg, Ky. has increased its capital stock from $2,000 to $10,000.

Dadeville Oil Mill, Dadeville, Ala., wants to purchase one 50-horsepower horizontal boiler and 100 or 120-horsepower Corliss engine.

Brosius Sewing Machine Co., Terre Haute, Ind., will remove its plant to Jackson, Tenn. Buildings will consist of machine shop, two stories, 65x165; foundry, 50x80, and engine and boiler house, 40x40.

George Whiting Co., 428 to 448 N. Halsted street, Chicago, manufacturers of punching and shearing machines and bending rolls, is in the market for new or second-hand 36x36x12 foot planer, 5-foot full universal radial drill, 31-inch swing lathe, 16 feet between center, shaper 18 inches or 20 inches, small lathes and drill presses, grinders, and 25 to 35-horsepower engine and boiler.

Columbus Iron Works Co., Columbus, Ga., will rebuild its plant, which was recently burned. Work will begin at once on the erection of a foundry, tin shop and handle and beam factory. The company wants catalogues of machine tools.

Birmingham Machinery & Supply Co., Birmingham, Ala., Ben S. Catchings, manager, has been organized to deal in all kinds of machinery and act as manufacturers' agents, etc.

Bowen & Street, Norfolk, Va., are in the market for second-hand 20-inch Barnes drill press and a second-hand hoisting engine, 8x10 complete, with boiler. Lidgerwood or Mundy preferred.

The Stenhouse Metallic Works Co., Battle Creek, Mich., has been organized with a capital of $250,000. Andrew W. Lockton, president, August Kapp, secretary. The company will manufacture convertable beds.

John Davis, 81 Haverhill street, Boston, wants to purchase an engine, balance wheel 14 to 18 feet in diameter.

O'Neill Mfg. Co., Rome, Ga., is in the market for two elevators of 5,000 to 7,000 pounds capacity, one hand elevator, 6x9 or 10 feet, and one power elevator, 8x12 or 14 feet.

J. E. Rhoads & Son, Third and Orange streets, Wilmington, Del., are in the market for second-hand Corliss engine, of not less than 50 horsepower.

The Franklin Rolling Mill & Foundry Co. is being organized at Franklin, Pa., and will make application for a Pennsylvania charter on May 13, with a capitalization of $750,000. The company will absorb the Electric Tripartite Steel Pole Co, of New Jersey. The organizers of the new company are Charles W. Mackey, Gen. Charles Miller, C. D. Bleakley, J. W. Rowland and J. S. Coffin.

The Golden Gate Iron & Steel Co., recently incorporated in New Jersey, has increased its capital stock to $10,000,000. The company proposes the erection of an iron and steel plant at San Francisco.

The incorporators of the recently organized Detroit Iron & Steel Co., Detroit, Mich., which intends to erect a blast furnace on Zug Island, as as follows: Daniel R. Hanna, Cleveland; Frank B. Richards, Cleveland; C. B. Warren, Detroit; F. R. Hazard, Solvay, N. Y.; C. W. Baird, Detroit; A. H. Green, Detroit; T. H. Eaton and A. M. Parker, Detroit.

Charles J. Dixon has purchased the plant of the Eagle Steel Specialty Co., Milwaukee, Wis., and will shortly reorganize the same.

The Eureka Foundry & Machine Co., Birmingham, Ala., has been incorporated with $5,000 capital for the purpose of operating a foundry and machine shop. G. W. Stirling, R. H. Pritchard and H. T. Lankford are the incorporators.

The St. Louis Brass Mfg. Co., of St. Louis, Mo., has been incorporated with $50,000 capital. The incorporators are G. A. Plens, A. C. Einstein, C. M. Wemper, S. D. Gratio, M. M. Konigsberg, J. Ross, F. N. Eikerle and E F. Guth.

The Standard Mfg. Co., Galesburg, Mich., which has been a limited partnership for many years, has been reorganized and incorporated with $200,000 capital. The company manufactures windmills and does a general foundry business.

The United States Cold Rolled Steel & Mfg. Co. has been incorporated in New Jersey for the purpose of engaging in the cold rolling of metals by a new process. Capital, $100,000. Henry W. Egner, Jr., Theodore Wagner, G. G. Aeschbach and O. Aeschbach are the incorporators.

The Standard Steel Co., with a proposed capitalization of $2,000,000, is negotiating with the citizens of Marietta, O., for the purpose of securing a bonus for the location of a steel plant at that place. J. F. McGinness, of Pittsburg, is president of the company, and E. M. Butz, of the same place, engineer. An option has already been secured on 500 acres of land at Marietta, and if the bonus can be secured it is probable that the plant will be erected. It is proposed to erect a Bessemer steel plant containing two converters, with a daily capacity of 300 tons; an open-hearth plant with a capacity of 300 tons; a beam mill with a capacity of 300 tons; a structural fitting shop and blooming and billet mills.

The Matawan Steel & Iron Co., Matawan, N. J., is in the market for a second-hand Erricson hot air pump, cylinder 10 inches diameter.

The Steel Re-utilization Co. has been incorporated under the laws of the state of New Jersey with $1,000,000, and will engage in the rerolling of old steel rails. The company has acquired the rights in this country of the patents of James E. York, mechanical engineer, 52 Broadway, New York. The incorporators of the company are A. E. Blackmar, L. E. Judson and K. K. McLaren.

The Thomas Devlin Mfg. Co., of Philadelphia, has been incorporated under the laws of New Jersey, with $1,000,000 capital, by Thomas Devlin, William J. Devlin, L. J. McGrath, Richard Mott and W. D. Olier.

New Construction:—

E. G. Insinger, Philadelphia, is erecting a machine shop 125x20 feet.

The Girard Foundry & Machine Co., Girard, O., contemplates the erection of an addition to its foundry and machine shop.

The Montpelier Cup & Metal Co., Hartford City, Ind., is erecting a new foundry, 50x150 feet.

The Cedar Rapids Pump Co., Cedar Rapids, Ia., has decided to erect a foundry, 72x58 feet, to be used exclusively in the casting of pumps.

The Havana Metal Wheel Co. is erecting an addition, 50x200 feet, at Lewiston, Ill.

The Union Iron Works, Oshkosh, Wis., will erect an engine building plant, the main building of which will be 48x208, and

an engine house 30x40 feet. A large amount of machinery will be installed in the machine shop.

The Utica Pipe Foundry, Utica, N. Y., will erect an addition to its foundry 85x46 feet. A new machine shop will also be erected 152x52 feet. The foundry will be commanded by a 30-ton crane and the machine shop by a 15-ton crane.

The York Safe & Lock Co., York, Pa., is erecting an addition to its machine shop, 70x220 feet.

The Western Tube Co., Kewanee, Ill., has had plans prepared for the erection of a machine shop, 238x128 feet. A large amount of tube fitting machinery will be required for the equipment of the building.

The Fargo Car Wheel & Iron Co., Fargo, N. D., contemplates the erection of a new plant, 100x400 feet.

The Fulton Iron & Engine Works, Detroit, Mich., is building a brick addition, three stories high, 14x80 feet.

Work on the erection of the power plant for the new shops of the Allis-Chalmers Co., at West Allis, Wis., was commenced last week. The building will be 575 feet long, 120 feet wide and 50 feet high. It will contain the central power station for the entire plant and also the blacksmith shop. The stack for the power plant will be 175 feet high.

The Niles Iron & Steel Roofing Co. will abandon its present plant within the next few months and will erect a building 72x200 feet adjoining the plant of the Niles Mining & Mill Supply Co., Niles, O.

Fires and Accidents:—

The plant of the Champion Iron Fence Works, Kenton, O., was destroyed by fire last week; loss, $100,000.

The engine and boiler rooms of the plant of the Phœnix Horseshoe Co., Joliet, Ill., were destroyed by fire recently; loss, $10,000.

The plant of the Hildreth Pump & Motor Works, Lansing, Mich., was damaged to the extent of $8,000 by fire last week.

The plant of the Carmody Foundry & Machine Co., Cedar Rapids, Ia., was completely destroyed by fire last week; loss, $25,000.

The Pittsburg District:—

The Dowerman Rivet & Bolt Manufacturing Co., Pittsburg, Pa., has placed its rivet department in operation and is prepared to make deliveries on open-hearth steel rivets of all descriptions. The machine shop of the plant has been in operation for the past two months. The equipment of the plant consists of one 75-h. p. boiler and engine, one 18-inch by 6-foot lathe, one 21-inch drill-press, one 24-inch shaper and two 1½-inch Ajax automatic rivet making machines. The plant will have a capacity of from 8 to 12 tons per day of ten hours.

The Hunt Foundry & Machine Co., with offices in the Frick Building, is erecting two one-story buildings at New Kensington, each 70x100 feet.

The American Foundry & Construction Co. has purchased a site at Hazelwood, Pittsburg, for the erection of its new plant.

The first cast of pig iron at furnace A of the Edgar Thomson plant of the Carnegie Steel Co. was made last week. This is the first furnace completed at this plant and has been operating on spiegeleisen ever since its completion 24 years ago. On account of the shortage of Bessemer iron, however, the furnace was compelled to change from spiegel. All the other furnaces of the plant that operated on ferro-manganese and spiegel are now on Bessemer iron. They will change back as soon as the present scarcity of Bessemer is past.

The Railway Steel Casting Co., which was recently incorporated with $300,000 capital, has decided to locate its plant at Tarentum, Pa.. A site of 20 acres of land has been purchased for a consideration of $30,000, and the erection of the plant will begin shortly. The foundry will be 340 feet long and 140 feet wide and will have a monthly capacity of about 1,000 tons. The output will consist principally of castings for railroad work. C. C. Smith, of the Union Steel Casting Co., is the chief promoter of the plant. Other incorporators are G. W. Eisenbeis, J. W. Anderson and W. P. Potter.

The Westinghouse Electric & Mfg. Co. will immediately commence the erection of its new foundry at Stewart Station on the Pennsylvania Railroad. The erection of an extension to the machine shop of the Westinghouse Machine Co. has also been commenced. The erection of this addition will increase the capacity of the machine shop fully one-third.

Work on the excavation of the two new blast furnaces to be erected at the Edgar Thomson plant of the Carnegie Steel Co. was commenced last week. Work on these furnaces will be hurried in order that they may be completed within six months.

The J. H. Adler Mfg. Co. has purchased four acres of land at Carnegie for the erection of a plant for the manufacture of gasoline stoves and ranges. Seven buildings are to be erected, the most important of which follow: Foundry, 70x150 feet; mounting room, 40x200 feet; finishing room, 30x120 feet; store and stock departments, 50x200 feet; enameling room, 50x100 feet, and press room, 30x100 feet.

The city of Allegheny has asked for bids for two 350-h. p. boilers, two 15,000,000 and one 5,000,000-gallon pumping engines for the city waterworks.

Work has been commenced on the erection of the Mathews wire fence plant which will be erected near the plant of the Union Steel Co., Donora, Pa.

James Rees & Sons, engine and boiler builders, will erect a two-story addition to their plant, 80x270 feet. The lower story will be used as a boiler shop and the upper story as a sheet iron department.

On May 1 the structural iron workers in this district will strike on account of the refusal of the American Bridge Co. to grant them their demands for an increase in wages from 40 to 50 cents an hour. The American Bridge Co. has already conceded an advance of 7½ cents, but the men insist on the 10-cent advance per hour.

The new brass foundry of the Pittsburg Meter Co., East Pittsburg, Pa., was placed in operation this week. This is one of the most complete foundries of its kind yet erected.

The Stuart Mfg. Co., of Pittsburg, will apply for a Pennsylvania charter on May 8. William Stuart, E. P. Cole and W. M. Swart are the incorporators. Capital, $100,000. The company has recently purchased 800 acres of rich clay and coal lands at Derry, Pa. The property will be immediately developed, coking ovens will be built and a fire brick plant will follow.

The American Furnace & Machine Co., of Pittsburg, has been incorporated under the laws of New Jersey with $100,000 capital. The company takes over the successful business of William Swindell & Bros., engineers. J. H. and J. D. Swindell and J. A. Null are the incorporators.

The New Kensington plant of the American Tin Plate Co., New Kensington, Pa., is being improved by the erection of a new tin house containing 14 stacks of improved type and five hot mills.

The A. Garrison Foundry Co., South Side, Pittsburg, is building a 38-inch plate mill for the Lukens Iron & Steel Co., Coatesville, Pa. The housings were cast last week.

General Industrial Notes:—

L. W. Beard, of Waukon, Ia., has optioned a tract of land at Moline, Ill., with a view to organizing a company to erect a blast furnace.

The Glen Iron Furnace, at Glen Iron, Pa., was blown in last week, having been idle for some time. The furnace property was recently acquired by the Glen Iron Furnace Co., of 14 South Broad street, Philadelphia, Pa. The company also controls about 500 acres of ore property in the vicinity of the furnace which is now being developed.

The finishing mills of the upper plant of the American Steel Hoop Co., Youngstown, O., recently established a new record. During a period of 24 hours the output was 522 tons, as compared with 497 tons, the best previous record.

The first cast in the new foundry of the Fred M. Prescott Steam Pump Co., at West Allis, Wis., was made last week. Nearly the entire cast was made into small souvenirs.

The Bostwick Steel Lath Co. advises us that it will not remove its plant from Niles, O. A site of several acres has been purchased upon which the new plant will be located.

Hassan, Tagge & Dean is the name of a recently organized engineering concern with offices in the Union Trust Building, Detroit, Mich. The members of the firm are electrical and mechanical engineers and will make a specialty of cement plants.

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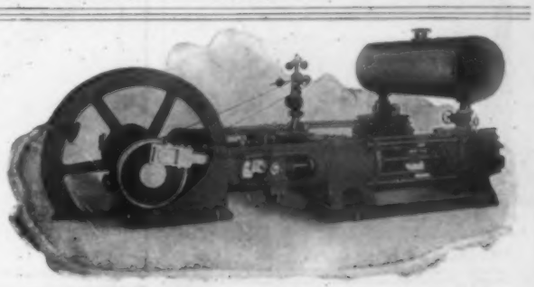

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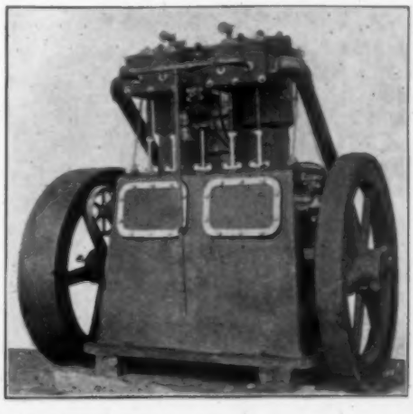

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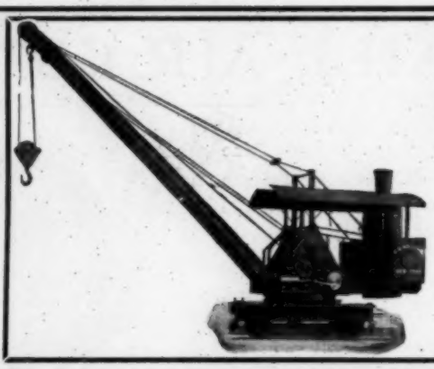

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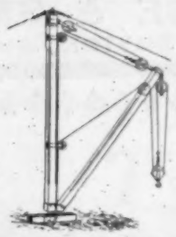

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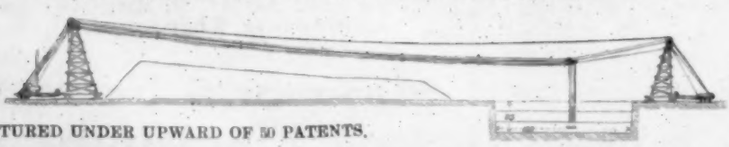

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